ACQUISITION SYSTEMS PROTECTION PLANNING
THE MANHATTAN PROJECT: A CASE STUDY

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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B.S., The Pennsylvania State University, University Park, Pennsylvania, 1982

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

ACQUISITON SYSTEMS PROTECTION PLANNING THE MANHATTAN PROJECT: A CASE STUDY by CPT (P) George E. Conklin II, USA, 135 pages.

This study examines the counterintelligence and security programs of the Manhattan Project, the United States acquisition of the atomic bomb, using the Department of Defense's Acquisition Systems Protection Program (ASPP) methodology. Using the ASPP methodology as presented in the April 1993 draft of Department of Defense Manual 5200.1, Acquistion Systems Program Protection, the study examines the Manhattan Project's: essential program information, technologies and systems (EPITS); foreign intelligence collection threat assessment, and countermeasures programs.

The study, using today's criteria, concludes that the project's countermeasures program was marginally successful because the project lacked a unifying security objective. Additionally, the project leadership failed to clearly identify and counteract the collection threat posed by wartime ally, the Soviet Union.

The study determined that there are lessons learned from the historical case that are applicable to the contemporary ASPP. Lessons learned include; proposed doctrinal changes, threat assessment methodology and counterintelligence techniques and procedures.

DEDICATION

This thesis is dedicated to my father, Master Sergeant George E. Conklin, whose fascination with the "great game" sparked my own and became the foundation for a career.

ACKNOWLEDGEMENTS

I would like to express my appreciation to my wife Karen and my daughters Jessica and Anna, not only for their support and patience in this endevour but for all the times, past, present and future, when I depart suddenly, without explanation to attend to the nation's business.

Finally, I would like to acknowledge; Special Agents James, Seymour, Barnett, Goebler and Smith who tutored me in the fine art of keeping secrets and whose dedication to the discipline of counterintelligence has been an inspiration. The following quotation is for them,

> A first rate counter-spy is an uncommonly skilled operative. He is cultivated by years of contact with a bizarre world of official decorum and government intrigue. He is trained and tempered as a weapon of defense by his contest with the most ingenious kinds of malefactors. In his methods and his habit of mind he is as different from a police detective or crime investigator as an asbestos curtain is different from a fire extinguisher. He is a sentinal and a preventative agent. Greatly prized by intelligent superior officers and almost of incalcuable value to the forces that safeguard his own country, the professional counter-spy profits continually from hazardous experience and, like cognac, grows smoother with the years.

Richard W. Rowan,
Secret Agents Against America, 1939

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CHAPTER 1

INTRODUCTION

Safeguarding the Technological Edge

Developing and maintaining a lead in critical technologies is essential to our military and economic well being as a nation. The need to develop and protect our technological lead was forcefully stated in the National Military Strategy of the United States published by the Chairman of the Joint Chiefs of Staff in January 1992:

> The United States must continue to rely heavily on technological superiority . . . to enhance the potential for swift, decisive termination of conflict. In peace, technological superiority is a key element of deterrence. In war, it enhances combat effectiveness and reduces loss of personnel and equipment. Our collective defeat of Iraq clearly demonstrates the need for a superior intelligence capability and the world's best weapons and supporting systems. We must continue to maintain our qualitative edge. Therefore, advancement in and *protection of technology is a national security obligation*.[1][Italics added]

This requirement was reaffirmed in the January 1993 National Security Strategy document:

> America's longer term economic position in the world will be determined by how well we succeed in . . . ensuring our lead in the crucial technologies of a new era. . . .[2]

While most Americans realize that the United States technology is at risk of being stolen, few appreciate the true magnitude of the technology loss problem and its impact on our military capability. The Russian space shuttle, AN-72, Su-25 and Mig 29 are all examples from the 1970s and early 1980s of how our stolen technology can be used to clone systems that can be used against us.[3] Such cloning, by a competitor or potential adversary, can substantially reduce America's technological lead and simultaneously save foreign governments billions of dollars in research, development, testing and evaluation (RDT&E) costs. Perhaps more disturbing is the rapidity with which potential adversaries and competitors have been able to counter or defeat the United States newest and most capable systems. Several recent studies have shown that adversaries, by stealing America's technological secrets during development, were able to initiate countermeasures against 75% of its new systems within three years of their full scale development and up to 50% of these developmental systems had countermeasures deployed against them within three years of fielding.[4] One security expert summarized the problem as follows:

> Of critical concern to U.S. strategists in the 1980s was the fact that the technological lead times in which U.S. weapons systems were judged effective against potential adversary were, in fact, consistently shrinking. As a result, systems which were developed and fielded with an anticipated life span of 15-20 years were, in many instances rendered militarily ineffective in 2 - 3 years by the fielding of countermeasures.[5]

From the preceding discussion it would appear that the end of the Cold War did not bring an end to concern about technology transfer, theft and espionage problems.

Indeed, the the end of the Cold War may have only made these problems more complicated.

A Changing Threat Environment

Three new trends have emerged since the end of the Cold War that have changed the threat to the United States defense technological base. First, there has been a blurring of the distinction between what is considered military and commercial technology and the way it is developed. The reduction of military expenditures has dramatically changed the way defense related technology is developed. As a result of defense budget cutbacks both government and industry are looking toward the increased development of "dual use" technologies that have both military and commercial application. This is done in order to spread development costs across as wide a marketing base as possible and reduce RDT&E costs. Indeed programs to transfer technology from government owned labs to private corporations was a centerpiece of the Bush and now the Clinton administration's economic competitiveness program. The majority of defense acquisiton development is now occuring in private industry which is very often developing variants of the same technology for commerical use.

Second, America's traditional adversaries, the former Soviet Union and much of the former Warsaw Pact, have not stopped conducting intelligence collection operations against her. They have, however, shifted the emphasis of their espionage efforts from purely military to more technological and economically oriented targets.[6] As early as 1990, Senator David Boren, Chairman of the Senate Select Committee on Intelligence remarked on this new trend:

> The fastest growing area of espionage activities by foreign governments against the U.S. is not the theft of military secrets, but the theft of commercial secrets from private American companies to further their national economic interests.[7]

Thirdly, they have been joined in this new "economic espionage" by countries whom we have traditionally considered friends and allies. Peter Schweitzer, in his book Friendly Spies, surveys the recent espionage efforts of a number of our allies, including; France, Israel, Germany, Japan and South Korea. The following statement by Pierre Marion, former head of the French intelligence service sums up the new environment:

> being allies does not prevent states from being competitors. Even during the Cold War, the economic competition existed. Now the competition between the states is moving from the political-military level to the economic and technological level. In economics, we are competitors, not allies . . . getting intelligence on economic, technological and industrial matters from a country with which you are allies is not incompatible with the fact that you are allies.[8]

Creation of the Aquisition Systems Protection Program (ASPP)

In the FY 91 DoD budget, Congress acknowledged both the requirement for the U.S. to protect its technological edge and the need to deal with the new threat environment. Specifically, Congress required the establishment of an office for Acquisition Systems Protection Oversight (ASPO) within the Office of the Secretary of Defense and the development of a protection strategy for correcting acquisition related security deficiencies.

In January 1991 the ASPO was established and began to develop the DoD Aquisition System Protection Program (ASPP) Master Plan. Additionally, they began to develop and promulgate ASPP policy and methodology. ASPP policy was written into Department of Defense Instruction (DODI) 5000.2 Defense Acquisition Policies and Procdecures, (February 23, 1991) and ASPP methodology and doctrine is beginning to take shape in DOD Manual (DODM) 5200.1, Acquisition Systems Protection Program, (Draft)(April 1993). A more detailed look at ASPP methodology and doctrine can be found in Chapter 3 of this thesis.

Problems Implementing the ASPP

Since 1991 the Army has attempted to implement the ASPP as outlined in DODI 5000.2, Defense Acquisition Policies and Procedures, (February 23, 1991). Early program protection surveys revealed that existing counter-intelligence and security efforts, while seemingly comprehensive, are primarily focused on meeting regulatory requirements and not on protecting essential program information from foreign intelligence service collection threats. This problem can often be attributed to a lack of understanding, by both the acquisition and security communities, of the role of program protection planning and especially the program security objective as the unifying focus for all supporting security efforts.

The lack of understanding of the role of program protection planning is due to the absence of a framework in which to discuss these concepts. Since the ASPP is a relatively young program there are no validated examples of successful or unsuccessful program protection schemes to use as a basis for discussion. When acquisition program managers and their supporting intelligence and security advisors sit down to discuss protection planning the discussion is often limited to either hypothetical examples or lessons learned from other contemporary programs. These contemporary programs are, at best, only a year or two further along in the process. There are no extant historical cases to use as examples to explain key technology protection concepts and principles.

The Need for Historical Case Studies

As program protection doctrine and methodology are developed, historical cases need to be identified to illustrate them. The power of using historical cases to illustrate doctrine is demonstrated in the newest edition of FM 100-5, Operations, (June, 1993), where historical examples are used to exemplify and illustrate key principles of the Army's warfighting philosophy. There is value in the development of similar historical case studies which examine program protection planning and the resulting security programs in the context of a completed acquisition cycle. There is also a need to develop case studies showing how the program manager's decisions in the protection planning arena can be traced through the system's lifecycle. How these early decisions can be linked to a developmental system's ultimate success or failure as a deterrent or on the battlefield.

Historical Case: Why the Manhattan Project?

The Manhattan Project is a historical case that allows for such analysis of emerging ASPP doctrine and methodology. At first glance using a 1940s acquisition project to illustrate a 1990s counterintelligence and security program may seem unusual. However, there are several reasons why the Manhattan Project is an excellent candidate for a case study that examines contemporary acquisition program protection planning.

America's effort to build an atomic bomb during World War II represented the single largest military research, development, testing, evaluation and acquisition effort up to that time.[9] The program manager, Major General Leslie R. Groves, had at his disposal all the resources of the United States wartime military industrial complex. (Groves began the project as a Brigadier General in 1942, was promoted to Major General in 1944 and was subsequently retired as a Lieutenant General. For clarity he will be referred to hereafter simply as General Groves.)[10] He had a unique mandate in that he was responsible for controlling all aspects of the acquisition of the atomic bomb including: research, development, testing, evaluation, production, and fielding of the weapons system. The effort involved not only government scientists and engineers but also many of the U.S.'s largest corporations. As such, the project was of sufficient size and scope as to address the entire spectrum of issues currently of concern in the ASPP.

Additionally, General Groves had a broad foreign intelligence, counterintelligence and security charter. He could initiate, on his own authority, foreign intelligence operations to answer his questions about foreign atomic research. His counterintelligence and security responsibilities spanned all of the continental United States; and covered not only military, but also industrial sites. He was able to call upon both military and civilian agencies, including the Federal Bureau of Investigation, to help construct his security apparatus. Unlike today's program managers Groves also had a dedicated security force under his control with which to execute this charter.

While the examination of more recent programs might yield more contemporary insights and lessons learned, they would be limited because of the problem of finding unclassified documentation concerning more recent acquisition programs. For example, much of the acquisition experience of the M1 Abrams tank, M2 Bradley fighting vehicle, F117 Stealth Fighter and other recent programs, especially the security history, are still classified. The Manhattan Project is not similarly affected by this limitation. In the years since the war the project and its outcomes have been well documented; considerable previously classified information has been released. Comprehensive studies have been conducted of the German and Japanese wartime atomic weapons programs. The success of the Soviet atomic espionage has been especially well researched. As a result, meaningful inferences can be drawn about the project's protection planning process and its impact on the successes and failures of its counterintelligence and security programs.

The Manhattan project's accelerated acquisition cycle also lends itself to a case study methodology. The program's acquisition cycle was compressed due to its wartime context and the bulk of the program was completed between 1942 and 1945. General Groves was the only program manager for the project during this period. The short acquisition cycle and unifying focus of a single manager should facilitate analysis of program protection planning decisions, the resultant security programs and their outcomes.

Lastly, there are some observable parallels between the current foreign intelligence collection threat environment and that facing the United States in the late 1930s and early 1940s. As previously mentioned the intelligence collection threat facing the U.S. is currently characterized by two major trends. The first is a shift from military espionage focused on military plans and dispositions towards economic or industrial espionage focused on technology. The second trend is the appearance of "friendly spies." Similar conditions existed in the U.S. during the prewar years. The most lucrative targets of World War II espionage were not soldiers, sailors and airmen but key physicists, chemists and engineers in the then emerging military industrial complex.

The greatest espionage threat to the Manhattan Project ultimately came, not from our wartime enemies, Germany and Japan, but from our wartime ally, the Soviet Union. Indeed, there is considerable evidence that much of the espionage network the Soviets successfully targeted against the Manhattan Project grew directly out of their pre-war industrial espionage effort.[11] The Rosenberg spy ring is a prime example of this point. David Greenglass, Ethel Rosenberg's brother and the only one of the spies who actually had access to atomic secrets, was a wartime recruit. However, Julius Rosenberg, his courier Harry Gold and much of the rest of the ring had been working for the Soviets spymasters Vassili Zubilin and Gaik Ovakimian conducting industrial espionage since the early 1930s.[12]

Delimitations

This study will focus on the period bounded by General Groves appointment as the program manager in 1942 until the use of the first two bombs against Japan in 1945. A brief examination of the prewar atomic research effort, its security ramifications and the continental United States espionage climate will establish a baseline for the analysis of the wartime period. Additionally, some research into and discussion of the major atomic espionage cases of the late 1940s and early 1950s; Fuchs, Nunn-May, Greenglass et.al., is used as a basis for analyzing the effectiveness of the Manhattan Project's counterintelligence and security effort.

The Thesis Question

This thesis answers the following question: Are the lessons learned from the counterintelligence and security operations conducted in support of the Manhattan Project applicable to the current Department of Defense Acquisition Systems Protection Program (ASPP)?

To develop the answer to this question the following secondary questions are addressed:

1. What were the project's key secrets or Essential Program Information, Technologies or Subsystems (EPITS)?

2. What was the Manhattan Project's security objective and how did it evolve?

3. What foreign intelligence effort was conducted to support the development of the security objective?

4. What foreign intelligence service threats were identified throughout the program's acquisition cycle?

5. When was the Soviet intelligence collection threat identified and what impact did this discovery have on the security objective?

6. What were the project's real and perceived security vulnerabilities?

7. What countermeasures did the project's security program employ?

8. Did the project's counterintelligence and security programs meet the security objective?

9. How effective and efficient were the security programs and what trade offs were made in their implementation?

This thesis will meet several broad objectives. First, to conduct a historical analysis of security planning and execution in the Manhattan Project. Second, to discern lessons learned from that analysis that will be of use to contemporary counterintelligence and security professionals in executing the ASPP. Finally, and perhaps most importantly, this thesis will serve as a historical case study that can be used by security policy makers for the development and illustration of emerging technology protection doctrine.

Background: A Brief History of "Nucleonics"

It is difficult, if not impossible, to pinpoint when the quest for an atomic bomb began. Where in the series of scientific discoveries that composed "nucleonics", the study of the nucleus of the atom, did it become possible to build the bomb? Certainly, Henri Becquerel's discovery of radioactivity in 1896 was the beginning. Rutherford's discoveries of the nucleus of the atom (1911) and artificial transmutation (1916) were milestones as was the Curies' discovery of radium.[13] James Chadwick's discovery of the neutron and Enrico Fermi's use of "slow neutrons" to create artificial atoms began the science of "nuclear chemistry" and brought the scientific world to the edge of the nuclear age.[14] During his 1934 experiments one of the elements Fermi had bombarded with neutrons had been the heaviest element, number 92 - uranium. Curiously, it did not behave like the other elements he had bombarded with neutrons;

> In the other heavy elements they had bombarded, the neutrons had changed the original element to and element near it on the periodic table. From iron, for example, they had created manganese. But with uranium the process was strangely different and mystifying . . . the bombardment had created more than one new element.[15]

Fermi was at a loss to explain this phenomenon, while one of the byproducts was, as expected, close to uranium, the other was not even close. Fermi had unknowingly made two important discoveries. The first was nuclear fission. The second was the first "manmade" elements, numbers 93 and 94, later to be called neptunium and plutonium respectively.

It would be four years before a group of German scientists would be able to explain Fermi's experiments and announce the "discovery" of fission to the world. In 1938 Otto Hahn and Fredrick Straussman, of the Kaiser Wilhelm Institute in Berlin, conclusively identified that one of the byproducts of the transmutation of uranium by neutron bombardment was barium - element 56.[16] Perhaps Fermi's uranium had not onl_ .ransmuted into another element but also been split into two existing elements - barium and krypton. Building on this discovery Lise Mietner and her nephew Otto Frisch developed the theory of fission which they published in the February 1939 issue of the British journal Nature.[17] One more major discovery was required for the race for the atomic bomb to become a sprint, the recognition of the feasibility of chain reactions.

Arguably, the concept of atomic chain reactions can be traced to the writings of science fiction author H. G. Wells. In his book, The Shape of Things to Come, Wells had given a glimpse of the future that was frighteningly close to what would soon come to pass,

> Never before in the history of warfare had there been a continuing explosive. Indeed up to the middle of the twentieth century the only explosives known were combustibles . . . and these atomic bombs which science burst upon the night were strange even to the men who used them . . . Such was the crowning triumph of military science, the ultimate explosive. . .[18]

Wells' book was a best seller in the fall of 1933 -- one of its more avid readers was a young Hungarian physicist named Leo Szilard.

Szilard would later cite, The Shape of Things to Come, an earlier Wells' book, The World Set Free, and discussions with Wells himself as the seeds which grew into the theory of chain reactions. Szilard thought he knew the secret that would make Wells' fiction become reality. The discovery of the neutron had made it possible. It was already known that Chadwick's neutron had a neutral atomic charge and could approach and be absorbed by the nucleus of an atom. Szilard made the leap,

> it . . . suddenly occurred to me that if we could find an element which is split by neutrons and which would emit *two* neutrons when it absorbed *one* neutron, such an element . . . could sustain a chain reaction . . . I didn't see at the moment just how one would go about finding such an element . . . but the idea never left me. . .it might be possible . . .to set up a chain reaction . . . and make atomic bombs.[19]

Enrico Fermi would find "the element" -- uranium, in 1934, the same year Szilard would file patents concerning the concept of atomic chain reactions. It would not be until 1939, when the two refugees from, came together at Columbia University, that the puzzle would be complete.

In early 1942, at Columbia's Pupin Laboratory, the two men would build a prototype nuclear pile, using graphite blocks to "slow down" neutrons, and prove that a uranium chain reaction was feasible. The chain reaction was not sustainable, that would come in December of 1942 after they moved their operation to Chicago, but they had proved it was possible.[20]

1940: Common Knowledge and Competition

A brief look at the state of atomic research, in each of the major atomic competitors in 1940 is in order to establish a basis for a further analysis of the Manhattan Project's EPITS and the threat facing them. This review will show that much of what the Manhattan project would later spend large amounts of time and money trying to protect was already widely known in the world physics community.

In his book, Atomic Energy for Military Purposes, Dr. Henry DeWolf Smyth, summarizes the general state of atomic research prior to the descent of the veil of military secrecy with the start of World War II. The key pieces of information presented below were extracted from that summary and were available to all the competing parties on the eve of war;

> (5) That fission in uranium could be produced by fast or slow (so called thermal velocity) neutrons; specifically, that slow neutrons caused fission in one isotope, U-235, but not in the other, U-238, and that fast neutrons had a lower probability of causing fission in U-235 than slow neutrons.
>
> (7) That the energy released per fission of a uranium nucleus was approximately 200 million electron volts.
>
> (8) That high-speed neutrons were emitted in the process of fission.

(9) That the average number of neutrons released per fission was somewhere between one and three.[21]

In short, the basic theoretical knowledge required to build atomic bombs was available to all concerned in the spring of 1940. Uranium fission, the means to accomplish it and the theoretical possibility of a chain reaction and resultant atomic explosion were common knowledge among the world's physicists. Additionally, from January to March 1940, Glenn T. Seaborg and his associates at Berkley had done extensive work trying to identify element 94, later called plutonium. By March, Seaborg had not only found element 94 but had proven that it too was fissionable.[22] As will be discussed in some detail later in this chapter, the real question, at this point, was who would be the first to overcome the challenges converting theory into reality.

By 1940 the Germans had arguably the most advanced atomic research effort in the world. Certainly it was the best organized. In September 1939, as German panzers rolled across Poland, the German War Department was already holding conferences in Berlin on "Preparatory Working Plan for Initiating Experiments on the Exploitation of Nuclear Fission" -- the beginnings of a German atomic bomb.[23]

The Germans also had a head start on the accumulation of the necessary raw materials required for an atomic research effort. For example, they had secured over a ton of uranium oxide from the Joachimsthal mines in Czechoslovakia, Europe's only uranium mine at the time.

They had also begun to take action to solve the more difficult problem of acquiring a suitable neutron moderator, in their case heavy water. As early as the 1920s, the German industrial giant I.G. Farben had begun buying stock in the Norsk Hydro company of Norway. Norsk Hydro, with its massive waterfall driven hydro-electric plant, was the only mass producer of heavy water in the world. Unfortunately for the German War Department, when it upped its requirement from three to thirty gallons a month, Norsk Hydro balked. Of course access to both Joachimsthal and Norsk Hydro would eventually be solved by the advance of the German Army. By the end of 1940 the Germans were positioned to rapidly expand their atomic research efforts.[24]

As noted previously, the Kaiser Wilhelm Institute in Berlin had been the key center for atomic research through the 1930s. Several key figures had fled Nazi Germany prior to the outbreak of war, including among others; Albert Einstein, Otto Hahn and Lise Meitner. Even so, a formidable group of world class physicists remained in Germany. The leader of this remaining group was Nobel prize winner Werner Heisenberg.

By 1940 Heisenberg and his team, like their Allied counterparts, were also investigating the possibilities of creating an atomic pile and self sustaining chain reaction. A rudimentary pile, which would ultimately use "heavy water" vice graphite as the neutron moderator, was taking shape outside Berlin, in Liepzieg. The unreliable flow of heavy water from the Norsk Hydro plant was Hiesenberg's primary handicap at this point and would continue to be throughout the war.

The Germans were also aware of plutonium and its potential as a fuel for atomic bombs. Carl von Weizsacker, at the Kaiser Wilhelm Institute, had come to the same conclusion as Glenn Seaborg had about the theoretical possibilities of plutonium. He had not, nor would he ever, advance beyond theory into the mechanics of separating it from uranium. As a result, the Germans would not realize that element 94 was fissionable.

The Germans also had one other temporary edge, better intelligence. At the time of the September 1939 conferences the Germans were already aware of the increase in tempo of uranium research in the United States and Britain.[25] Heisenberg was aware of Fermi's work on the pile at Columbia although he does not appear to be aware of graphite as a neutron moderator and had instead staked the future of the German bomb on the use of heavy water as the neutron moderator. The Germans had, like their U.S. counterparts, also identified that the economical separation of U235 from U238 was the core problem to the development of the bomb. As a result of their knowledge of the U.S. program the Germans worked feverishly to pick up the pace of their uranium research effort.

By September 1939 the Germans had identified all of the major technical challenges to the manufacture of an atomic bomb. They had also gotten a start on accumulating the necessary physicists, uranium and heavy water to begin their efforts. Additionally, they had a feel for the progress of their adversaries in the U.S. and had every reason to believe they had a solid, if not insurmountable, head start. Indeed, in October of 1939 Werner Heisenberg may well have known more about the U.S. effort than Franklin Delano Roosevelt, who would not receive his first briefing on the possibility of an atomic bomb until October 11, 1939.[26] Ironically, this would not be the last time that a U.S. president would be in such a position vis-a-vis an adversary.

The French atomic research effort was less sophisticated than the German but still formidable. The Joliet-Curies had been on the cutting edge of atomic research during the 1920s and 30s and had collected a number of world class physicists around them at their laboratory outside Paris. Chief among their researchers were Paul Van Halban and Lew Kowarski. In the fall of 1939 the Joliet-Curies had just started research on a self-sustaining chain reaction. They too, were deeply involved in the search for a neutron moderator that would create the "slow neutrons" which were key to a chain reaction. In the spring of 1940, nearly simultaneously with the Germans, they had settled on heavy water as the most likely moderator.[27]

The French scientists had begun working with their Ministry of Armaments on uranium research after the start of the war a few months after their German counterparts. With the backing of the government they had made some progress on acquiring the necessary raw materials for atomic research. The Germans were not alone in their interest in the heavy water supplies of Norsk Hydro. French Ministry of Armament officials slipped into Norway in March 1940 and persuaded Norsk Hydro officials to "donate" the existing supplies of heavy water to France.[28] Although the Joliet-Curies did not have the large amounts of uranium necessary to complete their research they had secured the promise of a future flow from the Union Miniere de Haut Katanga mines in the Belgian Congo. The Union Miniere mines had been discovered in 1913 and were the largest known source of uranium outside of Europe. The world renown scientist and discoverer of radium, Madame Marie Curie, had obtained her materials from the Union. The French were able to play on this historical tie to obtain first access to the Belgian uranium ores. The French program was about to move into high gear when the German invasion stopped it before it could get started. The Joliet-Curies would choose to ride out the war in Paris, but several of their associates including Van Halban would flee to Great Britain, with the French stocks of heavy water and copies of Joliet-Curies notes. Halban sought out and eventually succeeded in joining what would become the Allied atomic bomb effort.

The steady flow of fleeing scientists; Mietner, Frisch, Halban et al would bring a sense of urgency to the British atomic research effort that had been lacking up to 1939. Despite being the homeland of such great nucleonics pioneers as Rutherford and Chadwick, Britain would come late to the race for the atomic bomb. While British scientists had followed and contributed to the volumes of literature on uranium during the 1930s they had surprisingly missed the military implications of the debate. As strange as it may seem it would take the efforts and concern of these new emigres to jumpstart the atomic research program in Britain.

Specifically, it would be the work of two "enemy aliens" Otto Frisch and Rudolf Peierls, both refugees from Nazi Germany, that would put the British effort on track. Their contribution would come in the area of estimating the cross section of U235. The cross section is a physicist's measurement of the probability of a neutron being able to approach and fission the nucleus of an atom or harmlessly bounce off.[29] This calculation is the basis of determining the amount or, critical mass, of fissionable material required for a chain reaction and ultimately an explosion. Up until 1940 the conventional wisdom, put forth primarily by Niels Bohr was that the critical mass for uranium would probably be on the order of tons. Obviously, a bomb of this size would be impractical. Frisch and Peierls experiments showed that in fact when separated from U238, U235's cross section indicated a critical mass of pounds not tons.[30] In February, 1940 the two outcast physicists sent two papers outlining their discoveries and the ramifications for atomic bomb development to Sir Henry Tizard at the British Air Ministry. Tizard was the driving force behind British radar research and the application of science to warfare in general. He had also been the focal point of the British government's minimal uranium research effort since 1939. He recognized the importance of the German physicists findings and began the bureaucratic machinery of the ministry moving towards an atomic bomb.[31]

On April 10, 1940 the Tizard directed the formation of the Subcommittee on the Uranium Bomb of the Committee for the Scientific Study of Air Warfare, inscrutably code named MAUD.[32] At its first meeting, in addition to reviewing the work of Frisch and Pierls, the committee was also briefed by a visitor, Jacques Allier, an official from the French Ministry of Armaments. Allier warned the British of the German interest in the Norsk Hydro heavy water and urged a joint collaboration on atomic research. It was agreed at a second meeting on April 24 that Chadwick would undertake work on expanding Peierls' and Frisch's work and develop techniques for the separation of U235.[33]

The British may have gotten a late start on atomic bomb research but it was a rapid one. By October 1941 they had secured a steady flow of uranium from the Union Miniere mines in the Belgian Congo.[34] They had also built a research team, including Frisch, Pierls and Halban, around Chadwick and his cyclotron at the University of Liverpool. This team had made substantial progress on the theory of gaseous diffusion as a means to separate U235 and were exploring the possibilities of a heavy water pile.[35] However, they soon realized that with their limited industrial base subject to German air attack and a war to fight, they were going to need help. They decided to approach the Americans. The first formal Anglo-American exchange of atomic information occurred in October 1941. The race for the atomic bomb began to pick up speed.

During 1938 and 1939 as European physicists raced to publish articles on the new science of "nucleonics," halfway around the world the Japanese were reading everything they wrote. The men reading the European journals in Japan were not amateurs, but world class physicists. Although they had not been in the forefront of atomic research, the Japanese had been in the background at each of the major European institutes conducting uranium research. Yoshio Nishina, Japan's leading physicist and founder of the Rikken Institute, had studied with both Niels Bohr in Copenhagen and Ernest Lawrence at Berkeley.[36] Also at the Rikken was

Tameichi Yazaki, who had studied with Enrico Fermi. Working at Tokyo University was Ryokichi Sagane, who had also studied with Lawrence as well as with the British at the Cavendish Laboratory at Cambridge.[37]

These were the men that LTG Takeo Yasuda, director of the Aviation Technology Research Institute would send his project officer LTC Tatsusaburo Suzuki to consult with, when he first foresaw the potential of a fission bomb in April 1940. Six months later, in October 1941, Suzuki forwarded his report to Yausda. In it he concluded that an atomic bomb was technically feasible and that Japan had access to enough uranium in the northern portion of its Korean colony to support an atomic bomb development effort. Nishina had already begun work on uranium cross section analysis with a small cyclotron at the Rikken. Additionally, he was in the process of building a much bigger "atom smasher" with plans donated by his friend Ernest Lawrence. The Japanese had identified the U235 separation problem and had begun theoretical work on gaseous diffusion as a possible solution. Nishina had also recognized the value of an atomic pile to study chain reactions and had secured a small amount of heavy water from Norsk Hydro to use as a moderator. In April 1941 the Imperial Army Air Force authorized and funded the development of an atomic bomb. The Japanese were in the race for the atomic bomb - and no one outside Japan knew it.[38]

The Russian effort was the least sophisticated of the atomic research efforts existing in 1940. Atomic research in the Soviet Union had been primarily limited to "skillful laboratory work" on the part of a small group of Russian scientists lead by Igor Kurchatov. Kurchatov and his associates had been following the steady stream of uranium research articles in western scientific journals. In the June 1940 issue of the Physical Review they published their own article on rare spontaneous fissioning in uranium. When it drew no response from western physicists, Kurchatov became suspicious.[39] The subsequent dramatic decline in published literature on uranium, first in Germany and later in the U.S. and Britain lead him to believe that both parties had embarked on secret atomic weapons programs. The Russians guessed that a race was on, a race in which they were far behind, but in which they realized they should be running.[40]

The Early American Effort: 1939-42.

As discussed previously, by January 1939 the private atomic research program in the U.S. was well advanced. Fermi and Szilard were hard at work at Columbia trying to put together a uranium pile. Since they had decided to work with graphite as a moderator they did not experience the heavy water supply problem that their European competitors did. By October 1939 Edward Sengier, Manager of Union Miniere, had relocated its headquarters to New York and was accumulating as much uranium ore there as possible. Despite the war in Europe the U.S. would be able to buy as much uranium as it needed.[41] Meanwhile, several groups were at work at universities throughout the country on the U235 separation problem. For example, Alfred O. Nier was doing initial work on an electromagnetic method at the University of Minnesota. Work on a centrifuge method had been started by J.W. Beame at the University of Virgina.[42] In U.S. universities all the pieces of a world class atomic bomb program had fallen into place - without the U.S. government's involvement.

Before the end of 1939 the scientists, lead by emigres Szilard, Fermi and others, would succeed in securing the interest of the U.S. government in supporting their research efforts. Leo Szilard would be the prime catalyst in pushing for government involvement. It was at Szilard's insistence that Fermi made the first approach to the U.S. government about uranium research.[43]

In March 1939, Fermi met with RADM Stanford C. Hooper, then the Director of the Technical Division of the Office of the Chief of Naval Operations. Fermi's presentation was understated and conservative. When asked directly if an atomic bomb was possible, Fermi replied, "If I had to answer now, I'd have to say no."[44] The scientists first effort to win government support had fallen short. Szilard wouldn't give up.

Szilard secured an introduction to Alexander Sachs, a well known economist and informal advisor to President Roosevelt.[45] In order to bolster his position, Szilard decided to meet with Nobel prize winner Albert Einstein and seek his support in an approach to the President. Einstein, working with a draft prepared by Szilard, penned a letter for the President;

> Some recent work by E. Fermi and L. Szilard, which has been communicated to me . . . leads me to expect that the element uranium may be turned into a new and important source of energy . . . . This new phenomenon would also lead to the construction of bombs . . . extremely powerful bombs . . . .[46]

Armed with Einstein letter Szilard persuaded Sachs to speak directly to the President. In meetings on 11 and 12 October Sachs tenaciously presented the case for the atomic bomb. In the end the President's response was terse and matter of fact, "This requires action."[47]

The "action" the President directed was the formation of the Advisory Committee on Uranium, also known as the Briggs Committee after it's head L.J. Briggs, the Director of the Bureau of Standards. The committee met three times between October 1939 and June 1940. Its primary accomplishment was the provision of $6,000 for the purchase of graphite for the Columbia pile and the first approach by the government to Union Miniere to secure contracts for uranium ore.[48] The impact of the six months of the U.S. government's involvement in atomic research was less than impressive.

On 15 June 1940, the President formed established the National Defense Research Committee (NDRC) with Carnegie Institute president, Vannevar Bush as chairman. The purpose of the new committee was to direct, coordinate and carry out an integrated program of military research and development. Its charter was to include all U.S. atomic and uranium research for which a subcommittee, was formed.[49]

Under the new arrangement the pace of atomic research picked up speed rapidly. By the early spring of 1941 the NDRC had committed nearly $500,000 to atomic research at over a dozen universities, industrial laboratories and government agencies. These monies funded both Fermi's pile at Columbia as well as Lawrence and Cyborg plutonium work at Berkeley.[50]

In June 1941, the U.S. scientific development organization was reorganized again. The the Office of Scientific Research and Development was created to oversee both civilian and military research efforts. The Committee on Uranium was expanded and renamed the Section on Uranium but stayed under the control of the NDRC.

The structure of the U.S. atomic bomb effort continued to evolve. On 9 October 1941 Bush met with President Roosevelt and Vice President Henry Wallace to discuss the status of the atomic research effort. Bush had become convinced that the atomic bomb was not only feasible but that with enough work and resources it might be possible to build it in the near term. He also briefed the President on the information exchanges with the British and their optimism about the issue. The President concurred with Bush's assessment and directed the formation of a Top Policy Group to tackle the many policy issues included in any decision to take on the development of an actual bomb. This group would include the Vice President, Secretary of War Stimson, Army Chief of Staff General Marshall, NDRC Chairman James Conant and Bush. They were to begin work immediately.[51]

From December 1941 to June 1942 in a series of meetings and reports, Bush, Conant and the Top Policy Committee sketched out the framework of the U.S. atomic bomb building program.[52] In June 1942 Bush sent a summary and proposal for a production program through the Top Policy Group for staffing and presented it to the President on 17 June.[53] The memorandum recommended the pursuit of all four identified methods of separating fissionable material and where appropriate the construction of pilot manufacturing plants. Additionally, it placed the responsibility for overseeing the construction and operation of these plants with the U.S. Army Corps of Engineers;

> The construction of the plants designated . . . to be in charge of a qualified officer designated by the chief of Engineers . . . .[54]

The Manhattan Engineer District (MED), later known as the Manhattan Project, was about to be born.

ENDNOTES

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[7]Peter Schweizer, Friendly Spies, (New York: The Atlantic Monthly Press, 1993), p. 12.

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[16]Rhodes, pp. 258-262.

[17]Ibid., p. 52.

[18]H.G. Wells, The World Set Free, (London: Macmillan & Company, 1914) as cited in MacPherson, Time Bomb, p. 57.

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[22]Rhodes, pp. 353-356.

[23]Ibid., p. 31]

[24]Ibid., p. 326.

[25]Ibid., p. 311.

[26]Ibid., p. 313.

[27]Macpherson, p. 114.

[28]Ibid., p. 114-116.

[29]Ibid., p. 112.

[30]Rhodes, pp. 318-321 and Macpherson, pp. 110-113.

[31]Rhodes, p. 325.

[32]Rhodes, p. 330 and Macpherson, p. 121.

[33]Rhodes, p.330-31.

[34]Macpherson, p. 80.

[35]TS Correspondance of the Manhattan Project, (Washington, D.C.: Modern Military Branch, U.S. National Archives), File 13 - Background Information, Memorandum from Groves to Marshall, unticled, dated 29 October 1945.

[36]Rhodes, p. 346.

[37]Robert K. Wilcox, Japan's Secret War, (New York: Morrow and Company, 1985) p. 52.

[38]Wilcox, pp. 51-55, and 62 also Rhodes, pp. 327, 346, and 457.

[39]Rhodes, p. 327.

[40]Lectu'e, "Atom Spies and Stolen Secrets",by and interview with Richard Rhodes, Kansas City, Kansas, 16 February 1994.

[41]Leslie R. Groves, Now it Can Be Told, (New York: Harper Brothers, 1962), p. 34.

[42]Vincent C. Jones, Manhattan: The Army and the Atomic Bomb, (Washington, D.C.: U.S. Government Printing Office, 1985) p. 10.

[43]MacPherson, p. 76.

[44]Ibid., p. 75.

[45]Jones, p. 13.

[46]MacPherson, p. 89.

[47]Rhodes, pp. 314-15.

[48]Smyth, pp. 47-49.

[49]Jones, pp. 26-27.

[50]Ibid., p. 27.

[51]Ibid., p.33.

[52]Ibid., pp. 30-39.

[53]Smyth, p.82.

[54]Harrison-Bundy Files Relating to the Development of the Atomic Bomb, (Washington, D.C.: Modern Military History Branch, U.S. National Archives), RG 374, File 6 - Military Policy Committee Papers - Minutes, Memorandum Bush to Vice President Wallace, Secretary of War Stimson and General Marshall, Subject: Atomic Fission Bombs, dated 13 June 1942.

CHAPTER 2

LITERATURE REVIEW

Several comprehensive secondary sources exist that give excellent overviews of the Manhattan Project. The best and most comprehensive of these is the Pulitzer prize winning The Making of the Atomic Bomb by Richard Rhodes.[1] It is especially strong in its discussion of the prewar build up to the race for the bomb and its coverage of the technical challenges in producing the bomb. However, its discussion of security for the project is minimal. Manhattan: The Army and the Atomic Bomb by Vincent Jones is nearly as comprehensive and deals in more depth with the military administration of the project and program security.[2] Written as part of the U.S. Army in World War II Series published by the Center of Military History, it is an objective synthesis of the primary source material available in the National Archives. Time Bomb by Malcolm C. MacPherson, although less scholarly, is an extremely readable overview that provides the best single account comparing the various European atomic research efforts. It is also a good starting point for researchers who are not familiar with the technical terminology of nucleonics.[3] Anthony Cave Brown and Charles B. MacDonald's The Secret

History of the A Bomb[4] and Stephane Groueff Manhattan Project[5] are also good overviews.

Many of the key players in the administration and development of the Manhattan Project wrote autobiographies which form a considerable pool of primary sources on the subject. Of these, Now it Can be Told by General Leslie R. Groves, has the broadest scope.[6] As the program manager, General Groves was fully knowledgeable of all aspects of the program's development and this is reflected in the topically organized chapters of his book. It is the best source that documents his views of protection planning in the project and contains the closest thing to a discernable program security objective found in the literature. Indeed, Chapter 10, Security Arrangements and Press Censorship, is the starting point for any discussion of counterintelligence and security support to the Manhattan Project and is heavily quoted in the secondary sources. Lawren's, The General and the Bomb, published in 1988 is the best contemporary biography of Groves and makes extensive use of his papers and other recently declassified project files.[7] Pieces of the Action is a by Vannevar Bush[8], Atomic Quest by Arthur Compton[9], and My Several Lives by James Conant[10] are other examples of the autobiography genre. They provide differing perspectives of the issues considered at the policy and technology levels of the project. There is also some useful anecdotal information on the program's security measures and how they were perceived by the participants.

Numerous government documents of interest exist, especially those published by the Manhattan District.

The best single source for a discussion of the technical history of the development of the bomb is Henry De Wolf Smyth's, Atomic Energy for Military Purposes, published by the District immediately after the explosion of the first bomb.[11] There are also three microfilm collections that form the majority of the accessible primary source material on the Manhattan Project. The Manhattan Project: Official History and Documents, by University Publications of America is available at the Combined Arms Research Library (CARL) at Fort Leavenworth. This is a commercial version of the Manhattan Engineering District History, a microfilm set published by the Modern Military History Branch of the National Archives. It is the most frequently cited work in the secondary sources.[12] The Combined Arms Research Library has recently purchased two other sets from the National Archives, The Harrison-Bundy Files Relating to the Development of the Atomic Bomb 1942-1946 and the Correspondence (Top Secret) of the Manhattan Engineer District (MED) . The Harrison-Bundy Files are the most wide ranging and comprehensive collection of information on the project and represents the single best primary source generally available.[13] The Correspondence (Top Secret) of the Manhattan Engineering District contains key documents maintained by General Groves in his personal safe which were not made part of the official history and were not released until recently. They contain Groves correspondence with President Roosevelt, Secretary Stimson, Vannevar Bush and other. Files on security issues too sensitive for the general files, especially on Soviet espionage, are also found in the collection. By far this is the most revealing of the collections. This is because it contains personal correspondence between key figures in the project who because of the high security classification of the material felt free to be direct in their style and tone.[14]

There are several sources concerning the foreign intelligence service collection threat to the Manhattan Project.

The Soviet threat is the best documented. Several works were published in the early 1950s after the disclosure of Soviet wartime espionage in the United States. The best of these is probably Unmasked!: The Story of Soviet Espionage, by Ronald Seth.[15] Others include; Soviet Espionage by David Dallan[16], The Soviet Spies by Richard Hirsh[17] and the oft cited The Atom Spies by Oliver Pilat.[18] There were also a number of Congressional hearings into Soviet atomic espionage which resulted in substantive reports. The most prominent of these is the Joint Committee on Atomic Energy's Soviet Atomic Espionage.[19] This is in fact the best single source on the lesser known Soviet spies, especially those discovered at Berkley and Chicago during the war itself. In recent years the declassification of many of the military and Federal Bureau of Investigation's wartime files resulted in another round of espionage books. The most useful of these in terms of the "atomic spies" is Robert J. Lamphere's The FBI-KGB War: A Special Agent's Story.[20]

Richard Deacon's Kempei Tai: A History of the Japanese Secret Service is the best source on the Japanese espionage threat.[21] Running a close second is Ronald Seth's Secret Servants: The History of Japanese Espionage.[22]

A good overview of the prewar espionage climate in the United States is provided in R.W. Rowan's Secret Agents Against America which was published in 1939.[23] It gives a fairly comprehensive picture of the German and Japanese espionage efforts prior to the outbreak of World War II. It also briefly describes the threat, or perceived lack of threat, from the Soviet intelligence services in the continental United States.

In the area of intelligence support to the project and the analysis of foreign efforts to develop an atomic bomb several sources are available. Chapters--13,15 and 17 of Now it Can be Told provide a starting point. Boris Pash's The Alsos Mission is the most definitive and detailed description of the intelligence collection effort against

Germany. Pash lays out in some detail the planning and conduct of atomic intelligence collection activities of the detachments he led as the allied armies swept across Europe in 1944-45. The resulting conclusion that the German atomic research effort had never posed a serious threat is well articulated and supported.[24] The German Atomic Bomb by David Irving also addresses the subject of the German effort in some detail.[25] Japan's Secret War, by Robert Wilcox, although not particularly scholarly, provides a similarly detailed account of the Japanese atomic research effort and touches on the extent of Japanese espionage and knowledge of U.S. atomic weapons research efforts.[26]

The counterintelligence and security programs supporting the Manhattan Project are not as well documented. The subject is addressed peripherally in most of the aforementioned sources, however much of this is repetitive and not detailed enough for my purposes. None of the major security players wrote autobiographies. The best and most comprehensive source is the previously mentioned Manhattan Engineering District History. It and Groves, Now it Can Be Told are essentially the only two sources cited in the secondary sources. A sanitized version of Volume VIII - The CIC with Special Projects of the 30 volume, History of the Counter Intelligence Corps (CIC), which was published by the U.S. Army Intelligence Center, Fort Holabird, MD in 1959, is available through inter-library loan from the

Intelligence Center and School Library at Fort Huachuca.[27] The Combined Arms Research Library has only a classified version which has yet to be downgraded. While much of this document is a rehash of pertinent parts of the Manhattan Engineering District History it does contain some additional details on the organization and activities of the Manhattan Project's supporting Counter Intelligence Corps (CIC) Detachment. It also contains a brief survey of the type and extent of detected espionage activities directed against the project. Phillip Stern's The Oppenhiemer Case: Security on Trial, provides an excellent account of the day to day operations of the security program woven around the specifics of the case against the Manhattan Project's lead scientist.[28]

Very little research has been focused on the counterintelligence and security aspects of the Manhattan project. What attention has been given to these issues has revolved almost exclusively around the issue of how the Soviets were able to steal the "atomic secret." Almost no attention has been paid to the "why" of the Manhattan Project's counterintelligence and security programs. There are good descriptions of the project's various countermeasures programs in the primary sources. However, there is very little analysis or discussion in the secondary sources about why the project's security programs were pursued the way they were, i.e., program protection planning, and no assessments as to their effectiveness.

No gaps in the literature that would impede the completion of this thesis were identified.

ENDNOTES

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CHAPTER 3

RESEARCH DESIGN

The analysis of military history to illustrate and fill doctrinal gaps is well established. Review of the new FM 101-5, Operations, (June 1993) reveals the use of historic vignettes from such wide ranging conflicts as the American Civil War to Operation Desert Storm to illustrate current doctrine.[1] A lengthy examination of this subject is available in A Guide to the Study and Use of Military History, published by the U.S. Army's Center for Military History. In Chapter 1 of this book, Colonel Thomas E. Griess points out that although most military historians focus on operational history, the principles of military history apply equally as well to other categories including the administrative and technical aspects of warfare.[2] In Chapter 3, "An Approach to The Study of Military History," Lieutenant Colonel John F. Votaw outlines a method for conducting battle or campaign analysis, using a structured framework to examine military actions and draw lessons learned. Votaw stresses the importance of the analytical approach to this type of study and the significance of going beyond being a reader of history and becoming a crit_c.

> you are taking that step beyond merely understanding what happened and why it happened; judgement and assessment of accomplishments and errors are useful to the man interested in sharpening his perspective.[3]

In many respects this thesis will be a critical, retrospective, "battle analysis" of the counterespionage battle waged by the members of the Manhattan Project. It will result in an assessment of their accomplishments and shortcomings that will sharpen our perspective on how we conduct technology protection operations today.

This thesis is a case study analysis of the Manhattan Project's counterintelligence and security programs using the contemporary ASPP methodology as outlined in Department of Defense Instruction (DODI) 5000.2, Defense Acquisition Policies and Procedures, (23 February 1991)[4] and DOD Manual (DODM) 5200.1, Acquisition Systems Protection Program, (April, 1993) (Draft).[5] In a case study a set of principles or, as in this case, a model, is used to organize and interpret the facts of a historical case. Inferences and ultimately judgements, are drawn from this process in an effort to discern lessons learned that can be generalized for current or future use.

Several criteria are used to evaluate if lessons learned from the Manhattan Project apply to the contemporary ASPP. In general, the primary criteria will be whether the project's security programs fit the ASPP model. The project's security programs must be able to be analyzed using all of the five steps of the protection planning process outlined later in this chapter. Since the subordinate research questions are built around the five step ASPP process, if they can be answered positively, this criteria will be satisfied.

Specific lessons learned will be judged on three criteria. First, lessons learned must be valid. Lessons learned and the inferences establishing them should be supported by evidence from primary sources. If secondary sources are used, supporting facts must be traceable to primary sources. Second, lessons learned must be relevant in today's environment. The issue addressed by the lesson learned must be one that is still of concern today. Third, there must be an identified, feasible method for implementing the lesson learned in the current ASPP. For example, if project counterintelligence personnel used investigative techniques that are no longer legal in the modern context, then, regardless of how successful they might have been, recommending their use would not constitute a legitimate lesson learned.

Obviously it is dangerous to apply modern terms and standards to a historical case. The ASPP methodology is primarily used as a general framework to aid in identifying trends and factors within the protection scheme of the Manhattan Project which might have broader application. Only the larger, more conceptual steps in the ASPP model are used and many of the smaller more procedurally oriented steps in are intentionally omitted in the analysis. For example, much of DODI 5000.2 concerns the integration of security planning into the acquisition cycle and lays out the documentation requirements for each milestone review by the Defense Acquisition Board (DAB). Clearly, this portion of the ASPP has little utility for examining the Manhattan Project, neither the DAB or the milestone review process existed in the 1940s. However, there are portions of the ASPP methodology, especially in the program protection planning area, that apply easily to the analysis of a historical case.

The relevant portions of the ASPP model which is used to frame the analysis portion of the thesis are outlined below. Program protection planning is a deliberate, sequential, multistep process during which the program manager attempts to answer a series of interconnected questions about the security of the program.

The first of these questions is: *What do I need to protect?* The answer to this question relies on the early identification of essential program information, technology and systems (EPITS). EPITS are defined as information that could allow an opponent to kill, degrade, neutralize or clone the developmental system.[6] EPITS are most often found in the answers to the technical challenges that face the program manager. They are often the small conceptual and engineering advances which enable a weapons system to achieve a new capability over the previous generation of related technology. Of course, sometimes an EPIT is the adaptation of an old technology to a new purpose. On some occasions the mere existence of a capability in and of itself can be an EPIT, as in the case of Special Access Programs (SAP). Regardless, the EPITS are the core knowledge around which the entire program is structured. If the EPITS are compromised, then the developmental system will not be able to achieve its desired effect on the battlefield.

The second question the program manager must answer is: *Who do I need to protect my program's EPITS from?* This step consists of a multidisciplined counterintelligence threat assessment. It analyzes what foreign countries have a collection capability and an interest in targeting vulnerable EPITS.[7]

The third and fourth questions that must be answered are inter-related. *Where, and for how long, must the program's EPITS be protected?* This step consists of identifying the program's vulnerabilities. This is done by considering collectively the EPITS, the foreign intelligence collection threat and a third key ingredient -- time. Specifically, the program manager correlates his EPITS by location and time with the anticipated threat by location and time. This analysis yields the program's expected vulnerabilities -- those key locations and times when EPITS are at risk to specific foreign collection capabilities.[8]

While not a doctrinal term defined in DODM 5200.1, Acquisition Systems Program Protection, (Draft)(April, 1993), the program security objective is commonly used to summarize the program manager's answers to these questions. The program security objective encapsulates, in a single short statement, the program manager's assessment of what needs to be accomplished by his security program. It serves the same role as the "commander's intent" does in military operations, providing a single unifying focus for the counterintelligence and security effort in support of the program. Specifically, it provides the supporting security personnel with their mission statement. What do we have to protect, from whom and for how long? The security objective is the basis for the planning and development of the program's counterintelligence and security program.

The fifth and last major step in program protection planning is concerned with the question of countermeasures; *How will I protect my EPITS?* In this step the program manager, and his supporting counterintelligence and security advisors, must identify the countermeasures to be employed by program personnel to reduce, control, or eliminate the developmental system's vulnerabilities. The countermeasures must be specific and be time or event phased to efficiently and effectively counter the identified threats and vulnerabilities. All of the security disciplines should be considered in developing the countermeasures program.[9]

At the end of the planning process the program manager and his supporting security staff must translate the protection plan into a viable, cost effective, security program and implement it. Several key issues must be addressed at this point. Security programs have both a monetary cost and, more importantly, a time cost. For each layer of increasingly stringent security measures there is also an increasingly larger administrative burden. The time and money spent on background investigations, physical security enhancements, access control systems etc., increase, with a potentially negative effect on the program's efficiency. A cost benefit analysis is conducted to determine at what point security programs will have a disproportionate impact on the program's timeline. The program manager must assess what risks he is willing to assume and balance his security efforts against the overriding requirement to field his developmental system on time and on budget.[10]

The thrust of this thesis will be to explore how the Manhattan Project leadership answered the questions which flow from the program protection planning process. For the most part, the subordinate research questions parallel the steps of the planning process.

Secondary sources are used to establish the basic facts, review earlier assessments, surface issues and identify relevant primary sources. Primary sources materials are used to examine the program protection planning questions from the perspective of General Groves and the Manhattan Project leadership. The flow of the protection planning process is used to organize the analysis and each question in the process is addressed in order. Inferences and parallels between the historical case and the current ASPP environment are drawn at each step of the model. After applying the entire protection planning process to the Manhattan Project. The project's security programs are examined to determine how well they met General Groves' objectives. Outlined below is the intended approach to answering the secondary research questions.

First, the Manhattan Project's key secrets or EPITS must be identified retrospectively. This is accomplished by using the secondary sources to determine what the state of American atomic research was circa 1942 and which project scientists were most involved. Those scientists' autobiographies and other relevant primary sources, will be used to determine what technical challenges they perceived as being the most essential to building the atomic bomb. Solutions to those problems will be traced throughout the project's lifecycle and the key technological breakthroughs extracted to form the EPITS list.

Next, the nature and extent of the foreign intelligence service threat to the project is described. This question will be examined from several angles. The more recent secondary sources will be used to establish the historical facts of which nations were collecting against the project throughout its acquisition cycle. Primary sources will be used to examine the perceptions of the project's leadership and security personnel as to who posed an espionage threat to the project. Espionage literature of the period, primarily books published in the mid to late 1930s, will also be used to put the participant's perceptions in to context. The question of Soviet intelligence collection will be examined in some detail. Specifically, primary sources, will be used to determine when the Soviet threat was identified and what impact, if any, this discovery had on protection planning for the project.

Primary sources, especially the Manhattan Project: Official History and Documents and the CIC with Special Projects will be used to describe the project's countermeasures and security program. Secondary sources describing the Soviet collection successes as well as primary sources such as General Groves autobiography will be used to assess the effectiveness of the program.

ENDNOTES

[1]U.S., Department of the Army, FM 100-5, Operations, (Washington, D.C.: Government Printing Office, 1993).

[2]John E. Jessup, Jr. and Robert W. Coakley, A Guide to the Study and Use of Military History (Washington D.C.: U.S. Government Printing Office, 1979), p. 31.

[3]Ibid., p. 53.

[4]U.S. Department of Defense, Department of Defense Instruction 5200.1, Defense Acquisition Policies and Procedures, (Washington, D.C.: U.S. Government Printing Office, 23 February 1991).

[5]U.S. Department of Defense, Department of Defense Manual 5200.1-M, Acquisition Systems Protection Program, (Draft), (Washington D.C.: Assistant Secretary of Defense for Command, Control, Communications and Intelligence, April, 1993).

[6]Ibid., p. 3-5.

[7]Ibid., p. 3-7.

[8]Ibid., p. 3-7.

[9]Ibid., p. 3-10.

[10]Ibid., p. 3-11.

CHAPTER 4

ANALYSIS

A Brief Overview of the Manhattan Project

Less than two weeks after President Roosevelt initialed his approval of Bush's June 1942 memorandum, Colonel James C. Marshall stood up the Manhattan Engineer District (MED) at its new headquarters at 270 Broadway in New York City. The District Office was located in close proximity to the Corps of Engineers North Atlantic Division, for administrative support, and to the eventual prime contractor for the project, Stone and Webster Construction Company.[1]

From June until September 1942, COL Marshall and his growing staff began the extensive planning, site surveys, contracting and budgeting that were required to get the project off the ground.[2] A site near the Metallurgical Laboratory at the University of Chicago in the Argonne national forest was chosen for a pilot reactor facility. Other early contracts included upgrades to Lawrence's laboratory at Berkeley. Ground was broken at Trail, British Columbia on a heavy water production plant. While the graphite moderated pile seemed viable the project's leadership wasn't taking any chances, they would have a back up moderator ready. A large tract of land outside Knoxville, near Clinton, Tennessee, in the heart of the Tennessee Valley Authority, was purchased to support the first proposed production plant. It would be known as the Clinton Engineer Works and the government owned and operated city built to support it would be called Oak Ridge.[3] Sites at Los Alamos, New Mexico and Hanford Washington were also surveyed that summer for use as a weapons development/test range and second production facility respectively. The land at these later sites would not be acquired or construction started until 1943.[4]

In September 1942, Bush proposed to the Top Policy Group that an additional administrative layer be added to the project. He was concerned by the increasing size and scope of the project and the increasing difficulty in maintaining security. It was time for centralized control and execution of the program. He suggested and won approval for a Military Policy Committee, consisting of himself, Conant, and an Army and Navy representative, that would control and coordinate all aspects of the RDT&E of the atomic bomb.[5] Key to the committee concept was the appointment of a single officer who would execute the committee's decisions and serve as "the executive head of the development of the enterprise."[6]

On 23 September 1942, General Leslie R. Groves, as the executive of the Military Policy Committee, took charge of all aspects of the atomic bomb project.[7] The Manhattan Project's charter was enormous. As its leader Groves would serve as the focal point for everything associated with the completion of the project. He would not only supervise the District Engineer of the Manhattan Engineering District but also be responsible for coordinating the efforts of all the scientists, researchers and contractors working on the project. The project would be responsible for the acquisition of over 500,000 acres of property, the expenditure and accounting of almost 2 billion dollars, the construction and operation of several hundred industrial plants and facilities. Groves would also conduct such diverse activities as congressional liaison and international diplomacy.[8]

EPITS: The Atomic Bomb's Critical Secrets

> It is still an unending source of surprise to see how a few scribbles on a blackboard or a sheet of paper could change the course of human affairs.[9]
>
> \- Stanislaw Ulam

"The Myth of the Atomic Secret"

The security schema for the Manhattan Project was built on two primary fallacies, or what I term the "myth of the atomic secret" and the "myth of total protection." I will address the "myth of total protection" later in the chapter. The "myth of the atomic secret" is based on the common misperception, even today, that there was a single piece of information that enabled the U.S. to win the race for the atomic bomb. This myth must be understood and dispelled before a meaningful discussion of the project's critical secrets can be undertaken and the true problem in protecting the Manhattan Project understood. As our review of the history of nucleonics has shown a series of discoveries by a number of researchers were required to uncover uranium fission and the theoretical possibility of an atomic chain reaction. Converting these theoretical discoveries into a workable weapon would take the efforts of hundreds of thousands people over several years. Indeed the development of the atomic bomb was perhaps the most complex achievement of the age. The enormity of the effort and the number of technical challenges to be overcome argues. There was no single "atomic secret" - there were hundreds of them.

The Technical Challenges

As we have already explored, by 1940, several key technical challenges had been identified that needed to be resolved in order to build an atomic bomb. The core problem was how to separate enough fissionable material to create a bomb. Initially, this concerned how to separate the fissionable U235 isotope from the more abundant and more stable U238. Once the fissionable properties of plutonium were discovered a similar problem would exist for it. Once enough fissionable material was available for a weapon there were a constellation of problems in the mechanics of making the weapon work. The key issue in this regard was the development of a reliable and efficient detonation scheme.

Creating Fissionable Material

In his 17 June 1942 memorandum to President Roosevelt, Vannevar Bush presented four methods for overcoming the uranium separation problem; the electromagnetic method, the diffusion (sometimes called gaseous diffusion), the thermal diffusion method and the centrifuge.[10] All of the methods are based on using the different atomic weights (U235 is lighter than U238) of the isotopes to separate them. Each method had its own technical challenges, the solutions to these challenges would form the majority of the EPITS for the project. Below are brief descriptions of each method.

1. The Electromagnetic Method (code named Y-12). In this method a mass spectrometer or spectrograph is used to project a stream of uranium particles through a magnetic field. The two uranium isotopes are effected differently due to their different weights and leave the field in two separate fields. The U235 can then be collected using a collector. While the quality of separation using this method was excellent it was also incredibly slow. Using 1941 spectrograph technology it was estimated that it would take a year for each spectrograph to produce a kilogram of U235.[11] Lawrence's development of the first calutron, a hybrid of the spectrograph and the powerful magnet from his

cyclotron, indicated that industrial production might be feasible.[12] The mechanics of constructing the industrial size magnets and calutrons required for production were critical secrets. Also the chemical process for recovering uranium from the separation containers was essential.[13]

2. The Gaseous Diffusion Method (K-25). This method was based on the fact that when two gases of different atomic weights are passed through a porous barrier, the lighter gas will diffuse more quickly.[14] Although the process is theoretically straight forward the scientists and engineers faced several obstacles. Unfortunately, the uranium gas that most readily lent itself to diffusion, uranium hexaflouride, is extremely corrosive. Developing circulation materials and processes that could with stand this assault proved difficult. Additionally, in order to obtain U235 of the required purity many successive stages or cascades of the process must be conducted.[15] However, the most difficult obstacle to the gaseous diffusion method was the development of a suitable barrier material that could be mass produced with satisfactorily uniform quality. When finally developed formulation of the Kellex nickel based barrier material would be another critical secret or EPIT.[16]

3. The Thermal Diffusion Method (S-50). Sometimes referred to as liquid thermal diffusion this method is based on the principle that if a temperature gradient is formed in

a mixed liquid the lighter liquid will gravitate toward the warmer portion of the gradient.[17] While early experiments by the U.S. Navy showed that thermal diffusion could separate enriched uranium it was not of sufficient purity for weapons purposes. As a result this method was almost killed in early 1943. However, a suggestion by J. Robert Oppenheimer, to use the thermal diffusion product as "feeder" for the Y-12 electromagnetic process revived the method.[18]

4. The Centrifuge Method. In this method, uranium, in gaseous form, spins rapidly in cylinder until centrifugal force causes the atoms of U238 to form along the outer walls of the cylinder. The lighter U235 atoms are left near the axis of rotation and can be drawn off.[19] In order to achieve the purity required, repetitive stages would be required, perhaps as many as 5,000. It was estimated that 22,000 high speed centrifuges three feet long would be required.[20] Because of the magnitude of the engineering difficulties encountered the centrifuge method was abandoned late in 1942.[21] Since it was such a strong contender as a fix to the isotope separation problem, the fact that the centrifuge method was not viable would have been key information to an adversary and therefore an EPIT.

The technical solutions to the separation and handling of plutonium were also program EPITS. In addition to uranium separation, Bush also recommended in his 17 June memorandum, the construction of an "atomic power installation designed to furnish 0.1 kg. per day of element 94 [plutonium]."[22] Plutonium is a residual byproduct of a uranium chain reaction. The primary means of plutonium production was through the use of a atomic pile or reactor, nicknamed the X-10 process. Earlier in this chapter Fermi's and Szilard's work at Columbia and the University of Chicago in resulting in a self sustaining atomic pile was discussed. The mechanics of successfully constructing a working pile were clearly critical secrets. Additionally, the fact that graphite could be used as a neutron moderator in a uranium pile was unique to the American process. All the other major powers including the Germans were pursuing the heavy water approach. In as much as graphite was much cheaper and easier to obtain this gave the U.S. program a considerable advantage.[23]

Bomb Design

The design, engineering and manufacture of an actual nuclear weapon also had inherent technical challenges which had to be overcome. As with U235 and plutonium production the solutions to these technical challenges were EPITS candidates. Ultimately the weapons development program at Los Alamos would produce two distinctly different designs for atomic bombs; a "gun tube" style uranium bomb nicknamed "Little Boy" and an implosion type plutonium bomb named "Fat Man."

Before any weapons development could be completed, two problems, common to both designs, had to be solved. Before either uranium or plutonium could be used in a weapon they had to be converted into metal of the proper purity and configuration. Overcoming uranium's tendency to catch fire during processing and developing handling procedures for highly poisonous plutonium took up much of Los Alamos metallurgists time in 1943.[24] The second question was, exactly how much fissionable material was required for an effective weapon?[25] The answers to these two questions were crucial to final development of both weapon designs.

The gun tube design was relatively straight forward, was based on existing mechanical techniques and was the first design type undertaken.[26] In a gun tube type weapon a sphere of enriched uranium was fired along a tube into a like sphere to start the chain reaction. Development moved quickly and by March 1944 orders had been placed for the first gun tubes to be used in testing with uranium.[27]

Unfortunately, designing a plutonium bomb proved more challenging than the uranium bomb. The scientists and engineers at Los Alamos had discovered that plutonium did not lend itself to the gun tube design. When fired down the tube the plutonium "trigger" suffered "pre-ignition", exploding prior to impact with the second sphere of plutonium.[28] As a result they had to develop a method where the two bodies of plutonium could be brought together at a higher velocity than was possible with the gun tube design. The solution to this problem was found using the implosion concept. In this design a sphere of plutonium was surrounded with a layer of high explosives. The detonation of this outer layer would compress the plutonium sufficiently to start the chain reaction. In order for this process to work the shock wave created by the high explosive had to be almost perfectly symmetrical. The final solution to this symmetry problem involved the use of explosive "lenses" attached to the outside of the sphere to shape the shock wave.[29] The perfection of these lenses would make the implosion method viable. As an aside, it was drawings of these same lenses that David Greenglass, the technician who made them, would pass to his brother in law Julius Rosenberg.

What were the "real" secrets?

What were the "real" secrets of the Manhattan project? The answer to this question is the key to the coming analysis of the threat, security objective, countermeasures programs and assessment of the ultimate success of the Manhattan Project's security program.

The earlier review of the atomic research efforts of the major powers before the war reveals some of the things that were not the "real secrets" or EPITS of the Manhattan Project. Obviously the fact that Germany, France, Russia, Great Britain, Japan as well as the U.S. was engaged in atomic bomb research by 1940 shows that the military applications of the discovery of fission were not a secret. Likewise, contrary to conventional wisdom, the fact that the U.S. was engaged in atomic bomb research was not a secret. Indeed, although the size and scope of U.S. atomic research effort were cloudy, its existence was known or inferred (primarily from the scientific literature) by all the major powers. If these two commonly accepted conceptions of the "atomic secret" weren't EPITS, then what were they.

The true critical secrets of the Manhattan Project were much smaller in scope and dealt primarily with key pieces of the solutions to the technical challenges outlined above. They can be divided into three groups; advanced atomic theory, production/separation methods and critical bomb design information.

Advanced Atomic Theory. The physical discovery of plutonium and the fact that it would fission more readily than U235 was information that gave the U.S. a critical advantage in the search for the atomic bomb. Although the Germans, primarily Carl von Weizsacker, were aware of the theoretical existence of plutonium, they were not able to physically identify and separate it. The fact that plutonium was a byproduct of a uranium pile was the key secret in this regard.

Production/Separation Methods. The ability to separate and produce fissionable materials in industrial amounts was the primary obstacle to the successful development of atomic weapons. Four primary methods were developed and tested to overcome this obstacle. As discussed earlier each method possessed unique technical challenges which required significant research and development to overcome. The solutions to those challenges were EPITS, in that their compromise by an adversary would enable him to clone U.S. atomic technology. A prime example is the use of graphite as a neutron moderator in the successful uranium pile at the University of Chicago. The self sustaining chain reaction embodied in that pile was a "leap ahead" technology for the U.S. effort. The use of cheap abundant graphite as the moderator made it possible for the U.S. to achieve this breakthrough while the other major powers were fighting over limited heavy water reserves. The development of the nickel based Kellex barrier in the K-25 gaseous diffusion method and the calutron in the Y-12 electromagnetic method had similar impacts on U-235 separation.

Critical Bomb Design Information. Developing a workable atomic bomb had its own technical challenges and EPITS. The technical information on how much fissionable material was required for a bomb was clearly a critical secret. The fact that pre detonation problems required the use of an implosion methodology for detonation in plutonium bombs was an EPIT. The parameters and design of the explosive lenses that made implosion work was another critical secret which would enable an adversary to replicate U.S. success.

In 1940 the world's major powers knew that an atomic bomb was theoretically possible and that a race was underway to build it. What they did not know was if an atomic bomb was feasible. So while the existence of the U.S. program was not a viable EPIT, by 1943 the fact that the U.S. program was succeeding may have been. This was certainly the view of the project's supporting CIC detachment,

> By the middle of 1943, when the United States and other Allied scientists were convinced that they were making progress and that a successful end seemed in sight, the protection of this fact became equally important with the protection of the actual data concerning atomic energy.[30]

The existence of the U.S. atomic research effort was not a viable secret, but within the program there were hundreds of legitimate critical secrets that would be essential to anyone trying to build an atomic bomb. A number of nations had indications that the U.S. program was underway, and they wanted the secrets within it.

The Threat: Who wants the Bomb?

What nations posed an intelligence collection threat to the Manhattan Project? This issue can be explored from three angles. First, what sort of information was available during the prewar period for Groves and his counterintelligence personnel to use to make an assessment of the threat? Second, given this knowledge, who did the project leadership, specifically General Groves and his staff, perceive as threats to the project? Third, how did the project leadership's view of the threat change over its lifecycle?

The Prewar Threat Climate

One of the more widely read authors on espionage during the interwar period was Richard W. Rowan, whose books Spies in the Next War (1934) and Secret Agents Against America (1939) were both best sellers. While there is no evidence that General Groves or the project leadership read Rowan's books, they are representative of the espionage literature of the period. Mr. Rowan, who, albeit was somewhat of an alarmist, was convinced that espionage and sabotage would play a major role in the coming world war. He based his assessment on the success of the great powers of espionage efforts in World War I and the intensity of international espionage during the early and middle 1930s. This increase in peacetime espionage was especially worrisome,

> In a period of twenty-two months [ending in 1934] nearly six hundred persons have been arrested as spies in European countries alone . . . . And make no mistake about it, all this evidence . . . is not merely an intimation of the wars which are coming. It [espionage] is in itself a form of contemporary combat . . . .[31]

In articulating his vision of the role of "secret service" in the next war and specifically the threat to the U.S. he addressed three main themes. These themes were: that the focus of espionage was now on military technology; that sabotage would play a major role in the next war; and that the main espionage threat to the U.S. was from Japan and Germany. A fourth relevant, but minor theme, was that while the Russians were spying on us they did not pose a dangerous espionage threat.

Rowan appreciated the importance of evolving technology on the battlefield and therefore in the espionage business. He was convinced that the commercial and industrial spying of the interwar period were the forerunners of renewed wartime spying;

> since spies are now widely at work in commerce and industry, and trade wars and commercial espionage are both symptoms and definite preliminary phases of conflicts to come.[32]

Mr. Rowan was convinced that the lethality of evolving weapons made them attractive as targets of espionage,

> A war of gas, of new and even more terrific explosives, of incendiary bombings and other endless torments . . . should make the gamble of espionage universally attractive.[33]

He accurately predicted the relative value of well placed spies within an adversaries industrial complex.

> Industrial espionage, like the military spying which it imitates has become an international commonplace. But in the next war the secret service operative of a belligerent state who acts as a "factory-spy" will prove a far more dangerous foe than that splendid, obsolete unit, a cavalry regiment.[34]

Rowan was also extremely concerned about the use of widespread sabotage being part of the opening salvo of the next war. He envisioned a campaign of terror and sabotage carried out by thousands of prepositioned saboteurs, many coming from ethnic German and Japanese communities in the U.S.[35] In was to be a salvo that targeted not only the classic military targets of the past but a total war against the enemy economy and infrastructure, to include attacks on communications facilities, financial centers and industrial plants.[36]

When Rowan published his second book, in 1939, America had just come through several banner years of espionage cases, primarily involving the Germans and Japanese. These included the four German-Americans arrested in June of 1938 as part of what J Edgar Hoover characterized as "the smashing of the greatest spy ring since the World War."[37] In addition to the four arrestee there were fourteen co-conspirators who evaded arrest and fled to Germany. In 1936 on the Japanese side there was the Thompson/Miyazaki case involving the theft of U.S. naval secrets. Japanese Naval Lieutenant Commander Toshio Miyazaki had operated as an intelligence collector and agent handler on and off throughout the 1930s under both diplomatic and student cover.[38] That same year two more Japanese naval officers Yosiyuki Itimiya and Okira Yamaki were arrested and declared persona non grata after the arrest of John Farnsworth, a former U.S. naval officer who was convicted of espionage.[39]

This spike of activity colored Rowan's analysis of the threat. Despite the fact that his own charts showed the Soviets as the world leader in intelligence spending he focused on the spending of America's likely adversaries in the next war,

> Japan, Germany and Italy, those impoverished but belligerent partners, spent more that eighty millions on secret service in 1938. Eighty millions they admitted![40]

Clearly between the rash of spy cases and the enormous resources being put into their espionage efforts, the Axis was the clear and present danger to the U.S. in the coming war.

In the early to mid 1930s, during the depth of the Great Depression, there was also considerable concern about the possibility of a Russian lead Communist revolt in America. This concern surfaces in Rowan's accounts of interwar espionage. In both of Rowan's books he offers examples of Russian espionage against the U.S. military only to explain or mitigate it away. For example the arrest of Corporal Ralph Osman of the Panama Canal Zone garrison met with the following analysis,

> It had been charged that he had access to the headquarters secret file at Fort Sherman and had transmitted documents to a "Re_" agent. But Soviet Russia's military dangers today are fairly remote from the Panama Canal. And the only Russian battle fleet in the Pacific rusts at the bottom of the Sea of Japan.[41]

The 1938 arrest of Los Angeles Intourist director Mikhail Gorin and his wife on espionage charges serves as another example of the benign almost casual attitude toward Soviet espionage. Gorin's compromise of the Naval Intelligence office in Los Angeles is dismissed by Rowan as trivial because the documents stolen concerned intelligence on the Japanese, a common adversary. The following commentary sums up the prewar view of the Russian threat,

> There is little evidence that Soviet secret agents endanger the stability of the American government. Reds are an old nightmare, and Red or Communist agitation may persist as a lurking social menace. However, it is very seldom a Soviet Russian menace; it is a threat of local origin.[42]

Rowan's views of the threat facing the U.S. in the coming war represented the conventional wisdom of the day on the subject of espionage. It would be against this backdrop that the Manhattan Project leadership would plan their security program.

Foreign Intelligence and Threat Assessments

Research does not reveal evidence that a formal counterintelligence assessment was ever conducted for the Manhattan Project. No such document or the mention of it appears in either the Manhattan Engineering District History or The CIC with Special Projects history. In Now it Can Be Told, Groves laments the fact that he received no definitive assessment of the threat posed to his project,

> Never once was any definite country named to me as the one against which our major security effort

> should be aimed. At first it seemed logical to direct it toward the Axis Powers, with particular emphasis on Germany. She was our only enemy with the capacity to take advantage of and information she might gain from us[43]

It should be kept in mind that Groves wrote this passage in 1962 after the "atomic spies" trials had revealed the breadth of Soviet espionage successes. Groves would have been understandably defensive about the issue given those disclosures clearly these feelings crept into the tone of his statement. However, his assessment of the threat is consistent with the conventional prewar counterintelligence wisdom.

The assessment of the intelligence collection threat to a program is primarily founded on an accurate understanding of the relative worth of program secrets to potential adversaries. In the case of the Manhattan Project, this equates to American knowledge of the state of atomic research in other countries. The identification, collection, processing and dissemination of this type of information is the purview of the foreign intelligence discipline.

As addressed earlier, by 1940, substantial efforts were underway in most of the industrial countries of Europe and to a lesser extent in Japan. A good deal of detail concerning these efforts had been published or at least verbally discussed among the key physicists who were for the most part acquainted with each other.

Yet, as late as December 1942, the project leadership still had no firm information on the progress of the German bomb. For example in a memorandum to President Roosevelt that month the following was the best assessment Mr. Bush could offer,

> This subject is an exceedingly difficult one on which to obtain information as to enemy activity. The subject has been pursued with Army Intelligence. We do know that Germany started work . . . in 1939 . . . . We do not know, unfortunately how much progress they have made. It must be realized, however, that almost no real information is available, and comparisons are hence nearly pure speculation.[44]

The project leadership was equally lacking of information on the Japanese research effort, however, were comfortable in making an assessment of the Japanese effort;

> Japan did not in our opinion have the industrial capacity, the scientific manpower or the essential raw material. Italy was in the same position. . . . We did not feel that information secured by Japan would reach Germany accurately or promptly, and we suspected that Italian-German intelligence channels were not too smooth either[45]

There is evidence that a limited foreign intelligence assessment was made of Russian capability to conduct atomic research. By late 1943 there were several disturbing clues leading to the conclusion that the Russian atomic research program was picking up steam. The Soviets had a new cyclotron running in Leningrad.[46]

Early in his administration General Groves began an effort to fill the gaps in his knowledge of the enemy's atomic research efforts. Originally, this took the form of a small information collating center, headed by CPT T.O. Jones, within the Manhattan Engineering District's Intelligence and Security section.[47] This section conducted open source reviews of major periodicals, newspapers, and scientific journals. It also served as a focal point for information provided by other agencies including Army G-2, the Office of Naval Intelligence, the FBI and Office of Strategic Services.[48]

By early 1943 these efforts had yielded results and several key components of the German atomic research and production effort were identified and targeted for destruction. These included the Norsk-Hydro heavy water plant in Rjukan, Norway. This plant was initially sabotaged by British run Norwegian resistance agents and was subsequently bombed by the Allies in 1943.[49] Other facilities targeted in 1943 included the Research Institute of Physics and the Research Institute for Physical Chemistry and Electrochemistry in Berlin.[50] In 1945 the Auergesellschaft corporation uranium metal plant at Oranienburg, Germany was also destroyed in an effort to hinder the German atomic research program.[51]

In the late fall of 1943, Groves was asked by Army Chief of Staff George Marshall, with the concurrence of the Army's Assistant Chief of Staff,G-2 (Intelligence) to take responsibility for all foreign intelligence collection and production concerning atomic energy. Groves had the following to say about his new mission,

> The new intelligence mission of the MED was clear: We had to learn as soon as we could what the Germans might be able to do if they exerted every possible effort to produce an atomic bomb.[52]

So by the fall of 1943 the Manhattan Project leadership was still unsure of the state of the German atomic bomb effort and had focused it's limited collection assets against the Germans and only secondarily against the emerging Russian threat.

The fall of 1943, and the invasion of Italy, brought the opportunity for Manhattan Project intelligence officers to learn first hand of enemy atomic research efforts. A special mission unit nicknamed ALSOS was formed under the leadership of CIC LTC Boris T. Pash and dispatched to Italy with the following mission,

> To obtain advance information regarding scientific developments in progress in enemy research and development establishments which are directed towards new weapons of war or new tactics . . . and secure all important persons, laboratories, and scientific information . . . before their dispersal or destruction.[53]

In other words, the Manhattan Project was going to attempt to swoop in with the front line troops, seize and dismantle the Axis atomic research effort before it could be hidden. The Italian ALSOS mission met with limited success and was followed by subsequent missions in Germany after D-Day with the following result, On the basis of information thus gathered, we were able to locate the various elements of the German project and her stocks of basic materials as the Allied Armies advanced. All but insignificant quantities of the basic materials available to Germany have been seized. The most important of her scientists, capable of work in this field, have been captured and the state of progress and knowledge in Germany accurately ascertained.[54]

Manhattan Project officials were able to make the following assessment of German progress,

The Germans had reached a point of research substantially equivalent to the status of research going on in the U.S. at the time the Army took over the project in August, 1942. They recognized the possibility of the construction of a military weapon, but believed that it would take many years to develop it. They knew of the existence of element 49 and some of it's properties, but had never produced any of it. They had constructed three small piles but they were not self sustaining. They had developed, on a small experimental scale, methods of separation of isotopes but had separated on minute quantities.[55]

The German atomic bomb effort had been grossly over estimated. While they had pursued the bomb, and were aware of the U.S. effort to pursue it, they had been unable to compromise the critical secrets that would have assisted them in that endeavor.

By the end of their mission the ALSOS investigators were beginning to show some concern about the real threat to the U.S. program, the Russians. The following brief but ominous assessment was in their final report,

Means to ascertain the complete picture of the work in Germany did exist in that area under Russian control. The extent to which it remains is unknown. A complete underground laboratory and library of reports existed in Berlin and may be intact.[56]

Counterintelligence and Threat Assessment

A second method of gaining insight into the threats facing a program is to monitor and analyze the efforts of the potential adversary's intelligence service. This is an ancillary function of the counterintelligence discipline. An old cliche rings true in the counterintelligence business - actions speak louder than words. By determining what the adversary is actually trying to collect the counter-intelligence analyst can often determine what the opponent does and doesn't know. The following examination and analysis of the counterintelligence information available to the project's leadership during the war shows that this type of information pointed to the Russians and not the Germans as the primary threat to the project beginning as early as 1943.

German espionage and sabotage activity at the start of the war gave the impression that the feared sabotage campaign might come true. The June 1942 arrest of George John Dasch and seven other German agents after their landing on Long Island by submarine was perhaps the most famous case of the war.[57] This incident set the tone for the project's early security effort and was featured prominently in it's security education effort.[58]

Ultimately the German espionage threat to the project never materialized. The project's counter-intelligence personnel failed to surface a single case of

German espionage targeting the project during the war.[59] In August 1943 when the fear of a German bomb effort was still a grave concern, the Military Policy Committee reported the following assessment to the Top Policy Committee,

> no espionage activities by the Axis nations with respect to this project have been developed by our counterintelligence, although there have been suspicious incidents.[60]

A similar assessment was made by the Military Policy Committee again in February 1944.[61] If the Germans were trying to steal U.S. atomic secrets, they weren't trying very hard.

Through out the war counterintelligence information was also provided through double agent operations. During the war the British were successful in controlling the German espionage network in their country. This system of double agents was managed by an organization known as the Twenty (XX) Committee and hence referred to as the Double Cross System. On two occasions British double agents would be tasked by their German controllers for information on Allied atomic research efforts.[62]

In the first instance, in April 1942, a British double agent (TRICYCLE), then temporarily in the U.S., was given the following tasking,

> *Decay of Uranium*. According to some information obtained, there is reason to believe that the scientific works for the utilization of atomic energy are being driven forward in the U.S... continuous informations about the tests made on this subject are required and particularly: (1) what process is practiced...for the sending of heavy

> water? (2) Where are being made tests with more important quantities of uran [sic](Universities, industrial laboratories etc. (3) What other raw materials are being used...[63]

In the second instance, in November 1944, a British based agent (GELATINE), was tasked with the following question, "What part of London is the Uranium Research Institute, in charge of Professor Lise Meitner . . . ."[64]

In the U.S., the FBI was also successful in tracking German efforts through double agents. On 9 February 1945, J. Edgar Hoover sent a confidential memorandum to President Roosevelt, via his aide Harry Hopkins, outlining information regarding German efforts at atomic espionage. This particular memorandum dealt with FBI success in "playing back" the radio station of a captured German agent. The Abwher tasking messages to the agent revealed that the Germans had at least some knowledge of the U.S. atomic effort;

> First, where is heavy water being produced? In what quantities? What method? Who are the users? Second, in what Laboratories (sic) is work being carried on with large quantities of uranium? Did accidents happen there? What does the protection against Neutronic Rays consist of in these Laboratories? What is the material and strength of coating? Third, is anything known concerning the production of bodies or molecules cut of metallic uranium rods, tubes, plates? Are these bodies provided with coverings for protection? Of what do these coverings consist?[65]

This report provided General Groves with support for the assessment which was already coming out of the European ALSOS missions - the Germans were hopelessly behind. The nature of the German queries showed that they had gathered little in the way of detailed information, such as the location of key laboratories or production facilities, about the American program. Additionally, the questions are all oriented on information needed in the construction of a rudimentary atomic pile. If the Germans were still trying to construct a working reactor then it would be a virtually impossible for them to construct a bomb for use in the war.

In contrast to the Germans, the Russian intelligence collection effort had been aggressive from the beginning and was steadily increasing in intensity. Groves admits in Now It Can Be Told that he was aware of the Russian threat in 1942,

> I had learned within a week or two after my assignment that the only known espionage was that conducted by the Russians against the Berkeley laboratory, using American Communist sympathizers.[66]

This initial identification of the Soviet threat would be expanded by a steady stream of reports by key members of the supporting CIC detachment of cases of Soviet espionage.

In his book Unmasked!: The Story of Soviet Espionage author Ronald Seth describes the Soviet wartime atomic espionage effort as an outgrowth of prewar industrial espionage. Several eminent scientists who had become communists and had worked for the Soviets since the mid 1930s would prove valuable in this regard; Dr. Allan Nunn-May, Dr. Klaus Fuchs, the Italian Dr. Bruno Pontecorvo and Dr. Joliot-Curie. Although a special NKVD department, the

Atomic Division, was established, the Soviets used existing networks in the U.S. and Canada to collect the additional atomic intelligence required.[67] Seth describes these networks in terms of four spy "rings." Each would in the end be successful to some degree. David Greenglass's penetration of the secret bomb laboratory at Los Alamos would not be discovered until after the war as would the Soviets Canadian activity. The Soviet penetrations of the Radiation Laboratory at Berkeley, and the Metallurgy Laboratory at the University of Chicago would be discovered during the war and brought to the attention of the Manhattan Project leadership.

The Soviet targeting of the Radiation Laboratory at Berkeley was first detected by the FBI prior to the official start of the Manhattan Project. By March of 1943 the FBI was investigating one of the scientists at the laboratory who was in contact with Peter Ivanov a Soviet intelligence officer and vice consul in San Francisco.[68] On 5 April the FBI was fully briefed on the scope and importance of the Manhattan Project and a joint Army/FBI investigation began. Subsequent investigation revealed that the Soviets had begun approaching known communists in the program as early as October 1942. The majority of the approaches were made by a official of the Federation of Architects, Engineers, Chemists, and Technicians, Steve Nelson. The union was at that time involved in trying to organize the laboratory.[69]

In all cases the approach was similar, Soviet Russia, a wartime ally, was being denied information she vitally needed to survive in her fight against the Axis. As "fellow travellers" American communists had an obligation to do the morally right thing and pass along information the U.S. government would not.[70] Ultimately five laboratory employees were identified as having passed classified project information, including David Kamen who passed information on the X-10 or plutonium project. In all cases the information went via intelligence officers at the Soviets San Francisco consulate to the NKVD resident in Washington, Vassili M. Zubilin. Of the five spies identified none were arrested, two was fired and the other three had their draft deferments cancelled and were drafted into the Army and sent overseas.[71]

In August, 1943 another worrisome incident was brought to project security official's attention. J. Robert Oppenhiemer approached the regional CIC chief LTC Boris Pash and reported that he believed a close friend of his was in contact with Steve Nelson and might be soliciting and passing information about the project to the Soviets. When asked to provide the name of his friend Oppenhiemer refused. He was ultimately pressured into naming University of California Professor Haakon Chevalier only upon the personal intervention of General Groves. After further investigation did Oppenhiemer admit that he had in fact been approached by

Chevalier in March 1943 to commit espionage. Although he refused the attempt, this incident along with others would lead to the revocation of his security clearance in 1954.[72]

Meanwhile, based on the information obtained from Berkeley, the Soviets began an espionage assault on the Metallurgy Laboratory at the University of Chicago. For this operation the Soviets put in place a professional intelligence officer named Arthur Adams. By the time of his discovery in April 1944 Adams had successfully recruited at least five project employees using the "fellow traveller" approach. These agents passed information on both the Columbia University and Chicago University work on Fermi's uranium pile as well as the K-25 gaseous diffusion process.[73] As with the cases in Berkeley none of the identified spies were arrested or charged. Three were fired from the project, one kept his position until the end of the war and the most notable, Clarence Hiskey, had his reserve commission activated and spent the remainder of the war as a quartermaster supply officer in Canada and the South Pacific.[74]

The Manhattan Project faced other threats in addition to those posed by the direct assault of Soviet intelligence officers. While the Soviets were wartime allies and therefore their espionage could be considered "friendly spying," there were also incidents involving nationals from other allied countries. Two particular incidents merit examination and are representative of this type of threat.

The "French Situation" which developed in November 1944 was by far the most serious of these incidents. As covered earlier in the chapter, the French scientist, Hans Van Halban and associates had fled to Great Britain and joined their Tube Alloys (the British atomic program) research effort, first in Britain and ultimately in Canada. Van Halban had brought with him the entire French heavy water supply as well as notes of much of the French atomic research effort. Using the latter Van Halban successfully sought patents for a number of atomic related inventions on behalf of himself and Joliot-Curie who had remained in France. In an effort to gain use of these new inventions the British put Halban and his associates on contract to Tube Alloys.[75] Halban's arrangement with the British included a provision that he would be permitted to return to France whenever their "scientific position in the French Government Service" made it possible.[76]

In 1944 Joliot-Curie had been spirited to Britain by the ALSOS teams following behind Allied forces in liberated France. Upon learning that his mentor was safe Halban sought to meet with him in order to apprise him of the patent rights he had secured on his behalf. In November, during an unsupervised meeting with Joliot-Curie in Paris Halban passed along limited information about new developments from the British/American program. Halban passed the following information to Joliot-Curie: a chain reaction had been realized in a uranium pile utilizing both heavy water and graphite as a moderator; a chain reaction with ordinary water was possible and the fact that a pile will produce element 94 which is separable and fissable.[77]

In 1945 additional information became available that cast a new light on the "French Situation." In a February meeting between a British government official and Joliot-Curie the Frenchman made some disturbing remarks;

> It would clearly be very dangerous if any one nation occupied a dominant position in this field. If France was not to be admitted to collaboration with America and Britain she would have to turn to Russia . . . . Enquiry had been made of Russia as to whether she was interested. The answer was "yes."[78]

This ominous statement was followed in June 1945 by a cable from the U.S. military attache in London;

> It was only last week that Eve Curie told me in the strictest confidence that her brother-in-law and her sister both accepted direction from Moscow.[79]

While it was never proven that Joliot-Curie was a Soviet agent, he was in a position to provide them Manhattan Project secrets.

An incident in early 1945 involving a group of visiting Indian scientists provides another example of potential nontraditional threats to the project. The seven man Indian delegation, headed by Dr. Meghnad Saha and Sir Shanti Swarup Bhatnagar, was making a tour of various university and industrial research centers in the U.S. Dr. Saha proved especially inquisitive regarding uranium research, especially the fact that so many of the prewar experts, with whom he was acquainted, had "disappeared." Ultimately he was able to ascertain that there was a production outside of Knoxville, Tennessee that was using thermal diffusion to separate U235 to produce nuclear bombs.[80]

When questioned by CIC agents about their inquisitiveness Bhatnager gave them the following reply:

> Bhatnagar and Saha stated that with regard to the subject of uranium, it was their opinion that anyone with the slightest technical knowledge could plainly see that research in this field was going on and that therefore the treatment by the United States Army of this subject as a highly classified one appeared to be a very foolish thing.[81]

As noted earlier, by his own admission General Groves did not have a firm grasp on which nation posed the largest intelligence collection threat to his program when he took the reins in 1942. The foregoing analysis of the counterintelligence information available to him during the course of the war shows that at some point, certainly no later than 1943, it should have been clear that the Russians and not the Germans posed the greatest threat to his program.

The Myth of Total Protection

Before analyzing the project's security objective and countermeasures program we must look at their theoretical underpinnings. A key assumption in setting up the countermeasures program was the notion that the Manhattan Project could be completely protected from foreign intelligence collection. This notion resulted from what I call the "myth of total protection." This second myth is closely tied to the earlier discussion of the "myth of the atomic secret." If there is only one "atomic secret" then is should be possible to keep it completely secret and afford it "total protection" from potential adversaries.

In this regard the Manhattan Project may have been the nation's first Special Access Program (SAP). In a SAP the very exsistance of the program is the core secret or EPIT. As I will discuss later, the project leadership appears to have believed that "total protection" was possible for the Manhattan Project. If this is the case then the very existence of the project was the critical secret and should replace the EPIT list.

It is my contention that "total protection" was not a viable alternative for the Manhattan Project. As the discussion of the history of nucleonics and EPITs has shown there was no single "atomic secret" to protect. The notion that U.S. atomic research effort could be "totally protected" was a false one from the beginning. The bulk of the theoretical work on atomic fission was accomplished before 1940. As previously noted it was accomplished by a small group of scientists who were not only acquainted with each other but were also for the most part prolific writers;

> From this time on [January 30,1939] there was a steady flow of papers on the subject of fission so that by the time (December 6, 1939) L.A.Turner of Princeton wrote a review article in the *Reviews of Modern Physics* nearly one hundred papers had appeared. Complete analysis and discussion of these papers had appeared in Turner's article and elsewhere.[82]

Clearly there was too high a level of common knowledge for the adversaries to be completely unaware of each others interest in atomic research.

In modern technology protection doctrine a very clear distinction is drawn between SAPs and other acquisition programs and different protection methodologies are used in each case. In this thesis the ASPP model has been applied and not the SAP model because the Manhattan Project did not appear to be a viable SAP. For the Manhattan Project "total protection" was a myth.

Having said all this it is important to remember that the project leadership, including General Groves, went into 1942 believing that the "myth of total protection" still had validity. The project's security objective and countermeasures program must be viewed in that light.

The Security Objective

Before examining the Manhattan Projects security programs in detail the program security objective must be identified. There is no evidence of a written wartime security objective. Then as now, there was no regulatory requirement for the Manhattan Project to have one. However, from it's inception it was clear that security was going to play a major role in life of the project. An analysis of wartime and post war statements of the President, Vannevar Bush, General Groves and the supporting CIC unit reveal that all of them had a vision for the project's security effort. Unfortunately, while they sometimes overlap, none of them exactly match.

In a memorandum to General Groves, on June 29, 1943, President Roosevelt set the tone for how security would be handled in the new undertaking,

> The fact that the outcome of your labors is of such great significance to the nation requires that his project be even more drastically guarded than other highly secret war developments. As you know, I have therefore given directions that every precaution be taken to insure the security of your project.[83]

What, exactly, the President envisioned by this statement is not clear. He did not provide specifics in terms of what to protect or who to protect it from. Clearly, however, he expected something on a grand scale. The implication was that the Manhattan Project was to be protected; time, effort and money were not constraints.

Given the strength of the President's concern about security and the massiveness of the ensuing security program it is surprising to find that very little is written about the ultimate security objective of the program. Research revealed no evidence of a direct statement by General Groves about this issue during the war. After the war Groves summarized the project's security objective as follows;

> Our security aims were soon established. They were threefold: first, to keep the Germans from learning anything about our efforts or our technical and scientific advancements; next, to do all we could to ensure a complete surprise when the bomb was first used in combat and third to keep the Russians from learning of our discoveries and the details of our designs and processes.[84]

Once again this statement was made after the disclosure of the "atomic spies" success and must be considered in that light. We can indirectly gain an insight to the wartime thinking on this issue by looking at the CIC view of the security objective;

> From the inception of the security program in 1942, it was recognized that the goal was two fold: prevention of unintended disclosure of information that might find its was to the enemy and the prevention of espionage and sabotage through the infiltration of enemy agents.[85]

This statement, by the personnel charged with executing the security program, is dramatically different than the view of the program manager. In their view the program was to be protected from the "enemy" - Germany, and it is to be protected completely. No mention is made of the threat posed by America's wartime ally - Russia. It would appear that a gap existed between the program manager's perception and the security operators perception of the threat to the program. As we have already seen this split was not clean, key members of the CIC were heavily involved in investigating Soviet espionage. However, as we will see, the vast majority of the CIC agents, the rank and file security managers, and the bulk of the security effort would be focused solely on the Axis threat.

Two dichotomies begin to take shape as we analyze the above cited statements. Groves had differentiated between two specific threats and two different levels of security to deal with them. The threat from the Germans was viewed as being the number one priority and the security policy towards them is one of total secrecy. The Russians were of a secondary concern. Groves, in his post war statement, tacitly admitted that the Russians already had general knowledge of the bomb effort in 1942 and therefore the security policy was one of protecting "the details of our designs and processes." These divergent security policies would serve to work against each other. This issue surfaced during the Joint Committee on Atomic Energy's hearings on Soviet atomic espionage in 1951:

> The necessity of attempting to keep Germany and Japan totally in the dark meant that security efforts had to be so used as to shroud all information. . . . *The mere fact that an atomic project existed was secret*. [italics added] As a result security efforts were widely dispersed and could not be adequately concentrated upon screening the small numbers of people who would gain extensive knowledge and who could most assist Russia. . . .[86]

This perceived need to maintain absolute secrecy against the Germans caused the effort against the more potent and aggressive Russian threat to be unfocused. This dichotomy in the security effort was a running theme throughout the execution of the countermeasures programs.

Countermeasures Programs

Intelligence and security functions were performed within the Manhattan Engineering District by what would eventually be known as the Intelligence and Security Division. When the district was first formed a small Protective Security Section responsible for personnel security, security education and the safeguarding of military information. Other security and all counterintelligence support was provided on a direct support basis by the Army's Assistant Chief of Staff, G-2. In February 1943, a District Intelligence Section was formed with eleven geographic branch offices spread throughout the country supporting project activities. In December 1943, rapidly expanding investigative requirements drove the formation of a special Counterintelligence Corps (CIC) Detachment directly subordinate to the district. In conjunction with its organization, LTC John Lansdale, who had been orchestrating G-2 support to the project, transferred to the district and became General Groves' special assistant for security affairs. In February 1944, the Intelligence and Security Sections were merged into a full fledged division under the leadership of LTC William B. Parsons. The Intelligence and Security Division, configured into eleven branch offices and six functional branches served the project's needs for the remainder of the war. As of 1 July 1945 the division, including its CIC detachment, would number 143 officers and 156 enlisted men.[87]

For the majority of the war the Manhattan Project's security countermeasures effort was divided into five major programs; personnel security, plant protection, safeguarding military information, a shipment and courier system and counter- intelligence investigations.

The project's personnel security program relied primarily on traditional personnel security or background investigations as its foundation. An incredible 400,000 employees were investigated from the project's start until August 1945. Additionally, some 600 companies were investigated and granted facility clearance for work on the program.[88] The scope of these background investigations was not just concerned with the enemy inspired espionage,

> It provided for the investigation of such employees and companies and for the rejection or removal of any such found to be potentially disloyal, disaffected or subversive, or lacking in character, integrity or discretion to insure the security of classified information.[89]

The term "subversive" has a special meaning here, it is a euphemism for communist. It is interesting to note that throughout the Manhattan District History, which was classified secret, the word Russian or Soviet is never used. It is only when you read the top secret files and post war accounts and compare the details of specific investigations against those cited in the history that you realize that "subversive" investigations equate to investigations of "communists" and communist inspired Russian espionage. It is not clear whether this apparent sensitivity was due to potential political ramifications, or for some other reason.

This sensitivity, when combined with a general concern for the project's timely completion, lead to some interesting tradeoffs in personnel security, frequently known "subversives" were allowed to continue classified work,

> Where such discoveries were made [subversive contacts], intensive investigations were instituted immediately to determine the full significance of such contacts, and they were continued until sufficient information had been acquired to make a decision as to the advisability of retaining such persons on classified work. It would have been easier, of course, to have discharged all employees about whom there was some doubt as to loyalty. But the rights of the individual to work had to be considered . . . . Where an employee could be transferred to a less sensitive job and fulfill a need, he was usually retained . . . .[90]

The most famous instance of a known "subversive" being retained for project work was that of J. Robert Oppenheimer. In his case his communist affiliations and activities would not stand up against the more open post war scrutiny and ultimately he lost his security clearance in 1953. The project leadership's willingness to use key personnel who were acknowledged security risks was applied not only to some known communists but to a lesser degree to recent emigres from enemy countries.

The conscious use of potential security risks was a major reason for the use of non-traditional measures including defensive surveillance and the use of bodyguards as part of the personnel security program. For example, all top alien physicists used code names, Enrico Fermi became "Mr. Farmer." Additionally, they were all provided one or more body guards.[91] Extensive use was made of defensive and counter surveillance. Key personnel, including General Groves, were subject to random surveillance.

The plant security program was begun in June 1942 under the charter of the district's original Protective Security Section. It had as its goal the prevention of sabotage, fires, explosions and other accidents at any of the project's facilities including contractor facilities. The program was concerned primarily with the physical security of facilities whose destruction or closure could effect the project's "continuity of production." All facilities were categorized according to their relative importance and an intensive security inspection and survey program was put in place to insure that all priority facilities met centralized standards. The Area Engineer was charged with upgrading the protective measures; including fencing, alarm systems, flood lighting, guard forces, personnel control systems and fire protective measures to standard based on inspection findings.[92]

Obviously, such stringent security precautions were not without a cost. For example, one of the largest single line items in the security budget was for guards,

> By January 1945 there were more that 5,000 civilian guards protecting various installations . . . at an approximate cost of one million dollars a month. In addition, at the principal sites there were about 800 U.S. Army military police.[93]

While there is no estimate of the cost for the physical protection measures, such as fencing and lighting, the cost to equip over one hundred separate sites and contractor facilities with the required minimum must have been enormous.

The plant security program was considered a success by the project leadership,

> In general the plant protection program was considered to have been successful . . . as of December 1945 there was no known compromise of classified information or damage to buildings, equipment or materials which could be ascribed to a lack of physical protection. . . .[94]

This assessment should b[illegible]lanced against the demonstrated sabotage threat to project activities. In over 200 investigations of possible sabotage targeting the program not a single incident of confirmed sabotage was found.[95]

The safeguarding of military information program was primarily concerned with what is now called information security as well as censorship. The Army regulation governing information security was then, as now, AR 380-5. Most of the project's information security program was very traditional, classification management, reproduction controls and of course a plethora of security containers. In addition to these routine controls the project had two distinctive aspects to its information security program. A extraordinarily strict compartmentation policy and censorship program.

The cornerstone of the project's information security program was an extremely restrictive compartmentation program established by General Groves himself,

> Compartmentalization of knowledge, to me, was the very heart of security. My rule was simple and not capable of misinterpretation - each man should know everything he needed to know to do his job and nothing else.[96]

In practice this meant that scientists working on the project were segregated at the various facilities throughout the country. Travel between enclaves was controlled. In each facility the workers were divided again,

> employees . . . shall be organized into small working groups or teams so far as possible, each working on its own phase of the job and not being permitted to inspect or discuss the work being done by others.[97]

Many of the scientists chafed at the restrictions and complained that such tight control infringed on both on their intellectual freedom and the speed of the project's progress. While the project no doubt suffered from the compartmentation policy it was successful. As we have already seen the Russians were unable to obtain all the data they needed from any one single spy and had to mount operation after operation at multiple locations in order to succeed.

The Manhattan Project's censorship program was also extremely strong. It had it's roots in the scientists' voluntary prewar censorship policy beginning in 1939. In 1940, the program was formalized by the National Research Council and subsequently revalidated and strengthened by the National Defense Research Committee and OSRD. In 1942, with the start of the war, the censorship policy was formalized under Army control.[98]

Inside the Manhattan District the censorship review program began in July 1942 with one civilian analyst reviewing a few leading daily newspapers and periodicals. Throughout 1943 the program continued to grow and by years end four personnel were assigned to the program at the district headquarters and satellite programs were in place at all eleven branch intelligence offices. At its peak the program provided coverage of 370 newspapers and seventy magazines were reviewed. Review were not confined to censorship violations, of which several were identified and corrected, but also for items of general publicity about project personnel and locations. Additionally, information concerning atomic research in foreign countries was sought and eventually open source reviews became a valuable source of foreign intelligence.[99]

The censorship program could not detect everything written about U.S. atomic research. During their investigations the Alsos missions uncovered a number of examples of the German open source collection effort. The following example is from September 1941,

> In the United States scientific experiments are being made on a new bomb, according to a report from London appearing in the Stockholm Tidningen [a Stockholm newspaper]. The material used in the bomb is Uranium, and if the energy contained in this element were released, expl sions of heretofore undreamed of power could be achieved . . . .[100]

Considering the size of the project and the geographic dispersion of its facilities the censorship program was remarkably successful in hiding the program from intelligence services, like the Axis, that were operating from outside the continental United States.

The counterintelligence investigations program was perhaps the most sophisticated piece of the countermeasures program and was considered by the CIC agents to be their "primary business."[101] Investigations were considered the primary means of identifying threats to the project and were undertaken to support other parts of the countermeasures program as well as for their own sake.

The project's CIC detachment conducted six categories of investigations; personnel, espionage, sabotage, general subversive, Safeguarding Military Information (some of which were known as "loose talk" cases) and miscellaneous cases. Additionally, the CIC detachment was responsible for the initial investigation of all federal crimes on project installations, for counterintelligence screening, prior to passing them to the FBI.[102]

The role of each type of investigation, as well as the details of selected cases, has been explored in other parts of this chapter. While the role of investigations in the countermeasures program has been reviewed, the "how" of conducting investigations in the project is also of interest. Specifically, the project successfully used several lead development and investigative techniques that are no longer common today.

The CIC detachment relied upon several methods to generate leads for its investigations. The primary lead development tool was the use of volunteer sources or informants who reported suspicious incidents, "loose talk," or disloyal statements within their work areas. The majority of these sources were developed through the security education program, especially in small group "security talks" akin to the modern day SAEDA briefing. In a departure from today's practice the CIC also placed its own agents, undercover, into organizations as "listening posts." Special surveillance squads, often with commercial cover, were organized to support this activity. Agents posed as electricians, painters, exterminators, contractors, gamblers etc. in the course of developing and conducting investigations.[103] Additionally, investigative leads were sometimes generated by the "general surveillance program" which, as mentioned earlier, consisted of extensive random surveillance and countersurviellance operations, including joint surveillance with the FBI of known foreign intelligence officers.[104]

In terms of workload the CIC detachment was extraordinarily busy, it conducted over 400,000 personnel security investigations, 100 espionage cases, 200 sabotage cases, 1,000 general subversive cases and 1,500 cases where classified project information was transmitted to unauthorized persons.[105] While no summary exists that details how successful the program was overall, there is evidence that the investigations program was at least somewhat successful. Several thousand prospective employees were rejected during the conduct of personnel security investigations, including several fugitives who were arrested during the application process. Similarly, several companies were denied project work based on company clearance investigations. Most importantly, as discussed earlier over a dozen Soviet spies were successful neutralized during investigations of the Berkeley and Chicago spy rings.

Manhattan Project: Counterintelligence Success or Failure

The dropping of an atomic bomb on Hiroshima on August 6, 1945 took not only the Japanese but also the American public and world community completely by surprise.

In his statement announcing the bombing the Secretary of War commented on both the enormity of the bomb building effort and the shroud of secrecy around it;

> From the outset extraordinary secrecy and security measures have surrounded the project. This was personally ordered by the President and his orders have been strictly complied with. The work has been completely compartmentalized . . . as a result only a few highly placed persons in Government and science know the entire story.[106]

The initial post war blush of success would soon fade.

Before 1945 was over Igor Gousenko, a NKVD (the NKVD was a forerunner of the KGB) code clerk, would defect from the Russian embassy in Moscow with a suitcase full of documents that would begin the unravelling of the Soviet atomic espionage network. In rapid succession the wartime "atom spies" came out of the woodwork. Allan Nunn-May was arrested in 1946. Klaus Fuchs was arrested in early 1950. David Greenglass and the Rosenbergs, arrested in June 1950. Bruno Pontecorvo would drop from sight and reappear in Moscow in September of the same year. Before it was over the security programs of the Manhattan Project would be subject to ridicule and labeled a sham.

Which view of the project's counterintelligence and security posture is correct? The effectiveness of the project's security program can be examined by two general measures. The first is relatively straight forward: Did the security programs meet the project's security objectives? The second measure is more subjective: Was the security obtained, worth the cost? It is my assessment that the Manhattan Project's security program failed both measures to varying degrees.

As previously addressed the project's security objective, as stated by General Groves, had three parts: first, to prevent the Germans from gaining any knowledge of the project; second,to ensure surprise for the bomb's first use in combat, and third, to prevent the Russians from obtaining information on the bomb's key designs and processes.

The project was at least marginally successful in achieving the first objective. As pointed out earlier, the Germans had knowledge of U.S. atomic research prior to the U.S. entry into the war and continued attempts to collect intelligence on it into 1945. The discovery of wartime open source articles in German files confirms that the project's censorship program was not foolproof. However, the project's intense security program was sufficiently successful to keep Germany from obtaining enough additional detailed information to complete her bomb making program. The success of Groves' post 1942 foreign intelligence effort and the subsequent bombing of the Norsk Hydro and Oraineberg facilities played a critical role in the failure of the German efforts. Hiesenberg and his associates were never able to accumulate enough heavy water or uranium to build a working atomic pile. As a result they were unable to even prove the concept of a self sustaining chain reaction -- not to mention an atomic bomb. As a result the German scientists were no farther along in 1945 than the U.S. had been in 1942. Indeed, General Groves argues that the shocked reaction of the German scientists, who were in U.S. custody at the time, to the news of the Hiroshima blast, proved that they did not have an accurate picture of Allied atomic progress.[107]

The Germans were not the only ones who did not have an accurate picture of the Manhattan Project's progress towards an atomic bomb. As with Germany, Japan had been able to uncover the existence of a U.S. atomic research effort. In post war testimony several Japanese general officers stated that they knew about the American bomb project in early 1943.[108] However, once again the project's security shroud was sufficient to keep the enemy from determining the scope and speed of the project. The Japanese were shocked by the violence of the explosion, but, were still unwilling to accept the fact that the U.S. had been able to field an atomic weapon. Yoshi Nimira, the leading Japanese physicist rushed to the blast site and only after three days of investigation was able to prove that the bomb dropped on Hiroshima had been atomic.[109] General Groves could legitimately claim to have met his second objective, the U.S. possessed both strategic and tactical surprise when the first bomb was dropped on Hiroshima.

Probably the only nation not surprised by the events at Hiroshima was Russia. By the time of the Potsdam Conference the Russians had already compromised the majority of the project's EPITS and were well on the way to building their own bomb. Indeed, as author Richard Rhodes recently commented, "When Harry Truman told Stalin about the atomic bomb at Yalta, there is every reason to believe that Stalin knew more about it that Truman did."[110] There is still a significant historical and technical debate about the quality of the information that the "atom spies" stole and its value to the Russian atomic research effort. Richard Rhodes recently returned from the former Soviet Union, where he was researching an upcoming book on the Russian bomb. He returned with several key revelations from the KGB archives on this issue. Apparently, Kurchatov, the leader of the Russian effort, received detailed briefings from Beria, the head of the NKVD, on the results of Soviet atomic espionage in America beginning in the winter of 1942-43. Among the information eventually briefed were the details of the X-10 plutonium process stolen from Berkeley in 1943. During another such briefing on July 2, 1945, Beria gave Kurchatov a detailed briefing on the design of the Fatman plutonium bomb. No doubt this was the information passed by Fuchs and Greenglass. Rhodes was also able to confirm from Russian atomic archives that the bomb detonated in 1949 was an exact replica of the Fatman design used in the attack on

Nagasaki.[111] Based on this new evidence, clearly the Manhattan Project failed in it's third security objective - keeping the Russians from obtaining "key designs and processes." They had compromised almost every one of the EPITS identified in the analysis of critical secrets conducted earlier in this chapter.

In the following statement made from <u>Now it Can Be Told</u>, General Groves indirectly addresses the issue of the effectiveness of his security programs and attempts to mitigate the project's security failings.

> Nevertheless, security was not the primary object of the Manhattan Project. Our mission was to develop an atomic bomb of such power that it would bring the war to an end at the *earliest possible date* (italics added). Security was an essential element, but not all controlling.[112]

Groves implies that a key measure of effectiveness in acquisition system security is time. Even perfect security would be of little value to a program manager if it prevented him from his primary mission, the timely development and fielding of a successful weapon system. Groves argues that he was successful in balancing time against security. That, although the Russians were able to steal some atomic secrets, the Manhattan Project was able to accomplish its goal of delivering an atomic bomb in time to be used against Japan.

General Groves' argument in this regard is not entirely convincing. Many of the key scientists, most notably Leo Szilard, who albeit, had chafed at the security restrictions from the start, felt that Groves' strict compartmentalization policy had added months, perhaps years, to the project.[113] The following specific example was given by Szilard in testimony before a congressional committee after the war,

> compartmentalization of information was the cause for . . . failure to realize that light uranium [U235] might be produced in quantities sufficient to make atomic bombs . . . . We could have had it eighteen months earlier . . . . We did not put two and two together because the two two's were in a different compartment . . . .[114]

If Szilard's assertions were true then the project's security policies lead to its failure to produce a weapon in a timely fashion. It must remembered that the bomb making effort had originally been a competition with the Allies main adversary in the war - Germany.

Groves and the project leadership faced a difficult challenge in balancing security and time requirements, a challenge in which they failed on both counts. The massive security effort failed to stop the Russians from learning key atomic secrets that enabled them to save hundreds of millions of rubles in research and development costs and shave between one and ten years off of their atomic development cycle. At the same time those security efforts may have slowed U.S. development sufficiently to preclude the use of atomic weapons in the European theater.

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The Thesis Question Revisited

Are the lessons learned from the counter-intelligence and security operations conducted in support of the Manhattan Project applicable to the current Department of Defense Acquisition Systems Protection Program (ASPP)?

Lessons Learned

In answer to the thesis question, an analysis of the Manhattan Project using the ASPP methodology revealed a number of valid lessons learned for use in executing the ASPP program today. The Manhattan Project's counter-intelligence and security successes, and more often failures, yielded lessons learned in every step of today's ASPP process.

Evaluation Criteria

The first criteria for evaluating the potential lessons learned was whether the project's security programs fit the ASPP model. Applying the model to the case was relatively straight forward. Indeed, it was surprising how easily the 1990s ASPP methodology could be applied to a 1940s historical case and the wide variety of lessons learned that resulted. Lessons learned also had to be valid, relevant to the current program, and capable of implementation. Each of the lessons learned presented below has been constructed to address each of these criteria. The lesson learned begins with examples from the case followed by a discussion of its relevance and a recommendation for possible implementation. They have been organized into three functional groupings: doctrinal issues; threat identification and tracking issues; and countermeasures techniques and procedures.

Doctrinal Issues

The Manhattan Project case study surfaced several doctrinal issues of concern to counterintelligence and security professionals today.

1. The Security Objective Concept. Many of the Manhattan Project's security problems can be traced to the fact that a clear, unifying security objective was never established for the program. In Chapter 4, the security goals of General Groves and his supporting CIC element were compared. While they were consistent in regard to the German threat, it was clear that they were divergent regarding the Soviet threat. As a result, extensive countermeasures programs were built to conceal the very existence of the project from the Germans, but which were ineffective against the Russian threat. This problem can been alleviated by having the program manager publish his

security objective as a part of the program protection planning process. The security objective would function like the commander's "concept of the operation" does in other military operations. The security objective would provide the program manager's answer to the following three questions: What do I want to protect? How long do I want to protect it? Who do I want to protect it from? It would be published after the threat assessment step in the ASPP process and serve as a basis for the vulnerability assessment and countermeasures development steps. A change to the final DOD 5200.1-M, Acquisition Systems Security Program, would establish the use of the security objective as joint doctrine.

2. Organic vs. Matrix Security Support. The Manhattan Project was unique in that it had its own organic counterintelligence, security and foreign intelligence organization.[1] Today's Army program managers generally do not have full time security managers and must rely on the Army Material Command supporting matrix organization for security support and coordination with other supporting agencies. Current ASPP doctrine has the program office staff preparing key documents like the program protection plan with the *assistance* of the matrix support security staff.[2] Additionally, Intelligence and Security Command (INSCOM) provides other specialized security and counterintelligence support as resources permit.[3]

The Manhattan Project made good use of its organic security resources and had a number of successes to counterbalance its failings. As discussed in Chapter 4, the Axis powers failed to gain any usable information from the project. Project counterintelligence personnel conducted over 100 counterespionage investigations and neutralized over a dozen Soviet agents in the investigations at Berkeley and Chicago.[4] In great part these investigations were successful because the agents involved were part of the project, benefited from close daily contact with the project leadership, and were able to develop a clear understanding of the technical issues involved.

Clearly contemporary program managers do not have the resources to recreate the Manhattan Project's enviable security staff today. However, it would seem prudent to assign each major program manager a dedicated security manager or counterintelligence professional to work full time on program protection planning and coordinate intelligence and security support from other agencies.

Threat Identification and Tracking

The inability to accurately identify foreign intelligence collection threats was a critical weakness in the Manhattan Project's security program. A relatively sophisticated system for providing foreign intelligence collection threat support to program managers has evolved over the years. However, there are several lessons in this from the Manhattan Project case study which are applicable today.

1. Capability based "Objective" Threat. The April 1993 draft DOD 5200.1-M, Acquisition Systems Protection Program, defines threat in terms of the equation: (C+I)+V=T or (capability + interest) + vulnerability = threat.[5] In other words, a potential threat exists when someone has an interest in the program's EPITS, a collection capability to target them with and the program has a vulnerability they can exploit. The Manhattan Project case study provides an excellent illustration of why foreign intelligence collection threat assessments must be based on a framework similar to this definition. General Groves initially structured his view of the threat strictly in terms of those countries that were declared enemies and not in terms of who had an interest in his program and the capability to collect against it. Admittedly, in a wartime context, it was appropriate to focus first on the Axis powers. However, the obvious adversary may not necessarily be the only adversary. As we have seen the "friendly spy" was as prevalent in 1940 as in 1990. Had Groves and his predecessors assessed the threat objectively, based on collection capability, there was plenty of evidence of prewar Soviet espionage in the U.S. to cause concern.[6] Today, the intelligence production centers that support ASPP with threat assessments do so from a collection interest and capability perspective. However,

many program managers do not understand the full implications of the threat products they receive. As a result they often fail to identify the full range of threats facing their programs.

2. Threat is Dynamic. General Groves developed his security objective, and subsequently his countermeasures program, based on an incomplete understanding of the threat facing his program. Instead of the overwhelming Axis sabotage assault predicted before the war, Groves faced a subtle espionage campaign perpetrated by an ostensible wartime ally, the Soviet Union. Groves was made aware of, and acknowledged, the Soviet threat early in his administration but was unable to adjust sufficiently to defeat it.

The initial threat assessment is crucial in that it drives the development of the countermeasures program. Once in place these programs gather inertia and can be difficult to change. For example, by 1943, the Soviet espionage campaign against the program had been well documented, yet the project's CIC agents were still stressing the threat of "enemy" sabotage in their security talks.[7] The program manager must make regular reassessments of the threat facing his project and adjust his countermeasures program accordingly. The requirement for an Multidiscipline Counterintelligence (MDCI) Threat Assessment is documented in DODI 5000.2 Defense Acquisition Management Policies and

Procedures.[8] It is also addressed in the April 1993 draft of DOD 5200.1-M, Acquisition Systems Protection Program (Draft).[9] A MDCI must be developed and updated prior to each acquisition milestone review. However, that is as far as the requirement goes. Often these milestone reviews can be years apart. While the program manager can obtain updated threat information from his supporting counterintelligence unit as part of "continuing support" this interface is not required.[10] An annual revalidation of the program's threat assessment seems necessary and should be incorporated into the final DODM 5200.1-M.

3. Foreign Intelligence in Threat Assessment. To a large degree the Manhattan Project's security objective and programs were flawed because they were initially based on poor picture of the adversary's effort. Groves attempted to "totally protect" his project, from what he believed would be an Axis espionage onslaught. He devoted precious time and resources to this effort based on the assumption that they were racing to beat him to the atomic bomb. Only in late 1944 when the ALSOS missions revealed that the German effort was not viable would he realize that the Soviets represented the only real threat to his program.[11] Only when you understand the extent and nature of your adversary's research effort can you effectively protect your own. Program managers should receive training on the foreign intelligence collection system and their role as

both a consumers and providers of intelligence within the system.

4. Counterintelligence in Threat Assessment. The Manhattan Project had a wealth of counterintelligence information available to it beginning with the investigation of the Berkeley spy ring in the spring of 1943. That investigation showed that the Soviets were not only aware of the U.S. atomic research effort but were also willing to risk their relationship as an ally in order to compromise its secrets. The Berkeley investigation and subsequently the Chicago investigation also revealed a great deal about NKVD modus operandi. The Soviets were using a "fellow traveller" approach based on shared communist ideology to recruit U.S. citizens to commit espionage. Secrets were being sent back to Moscow using intelligence officers under diplomatic cover.[12] General Groves and the project leadership did not take full advantage of the counterintelligence information available. A simple analysis should have revealed that the Soviet pattern of collection. With the EPITS from both Chicago and Berkeley compromised, and Oppenhiemer having already been approached, an impending Soviet espionage assault on Los Alamos should have been anticipated. The Fuchs and Greenglass cases, targeting bomb design data at Los Alamos, should not have come as a surprise.

The lesson learned here is that EPITS development and countermeasures programs need to be adjusted to proven realities. Program managers today do not routinely receive detailed day to day information on counterintelligence activities within their programs. This is primarily because the counterintelligence personnel conducting them are not directly assigned to the program and do not work for the program manager. Requirements for continuing counterintelligence support and mandated periodic meetings between the program manager and the supporting counter-intelligence activity should be incorporated in the final DODM 5200.1-M and the implementing service directives.

Countermeasures Techniques and Procedures

Valuable lessons can be learned in the application of countermeasures techniques and procedures from both the successes and failures of the Manhattan Project security program.

1. Reemphasis on Investigations. As previously discussed, the Manhattan Project met with some success in countering the espionage threats targeted against it primarily at Berkeley and Chicago. In the majority of those cases aggressive investigations were used as the means to uncover and neutralize hostile agents. Manhattan Project CIC personnel made extensive use of physical and electronic surveillance to bring these investigations to a successful conclusion. Often these operations lasted for days and

crisscrossed the nation. CIC agents were frequently placed in close proximity to suspects both in and out of the work place using disguises and other undercover techniques. These same techniques were used defensively, fixed and mobile countersurviellance was a routine part of the project's security effort.[13]

The Army now relies almost exclusively on passive measures and techniques in program protection. Operations Security oriented Program Protection Surveys are now the primary counterintelligence technique used in technology protection operations. The current Army counterintelligence force possesses a very limited capability to conduct the aggressive, investigations oriented, counterintelligence operations that characterized the Manhattan Project's countermeasures program. These types of investigative skills should be reemphasized in the training of counterintelligence personnel and routinely encouraged in the development of protection schemes.

2. <u>Internal Sourcing</u>. The Manhattan Project made extensive use of internal sourcing, the use of human "listening posts" within project activities as a means of identifying both espionage and internal security threats. The majority of these sources were recruited from within the activities themselves, however, in especially sensitive activities specially trained CIC personnel were used. A

majority of the 100 counterespionage cases conducted by project CIC personnel were generated by this network.[14]

The U.S. Army does not currently have an approved counterintelligence internal source program. Given the success of these types of operations in support of the Manhattan Project, a study should be undertaken to determine the feasibility of instituting a contemporary internal source program.

3. Cost/Benefit Analysis for Countermeasures. By 1944, the Manhattan Project had built an impressive physical security shell around it's facilities, employing over 5,000 civilian guards at a cost of over one million dollars a month. Additionally, there were a large number of military guards with associated costs. There was also the cost of hundreds of miles of fencing, thousands of lights, locks, chain etc.[15] This massive effort was undertaken primarily to defeat the anticipated sabotage threat to the program. Yet not a single enemy saboteur was ever detected at a project facility.[16] No doubt some of the cost of physical security would have been incurred to counter the legitimate criminal threat to the project's expensive materials and machinery. However, in retrospect, some of these dollars could have been diverted to other security measures or program costs. There is a natural tendency to spend scarce security dollars on tangible physical security measures like fencing and electronic security systems instead of less

tangible security programs like security education. Ultimately program managers must decide where to allocate their scarce security dollars. A formalized framework of security cost benefit analysis would offer a means to help them make these difficult decisions. The April 1993 draft of DODM 5200.1-M, Acquisition Systems Protection Program, contains provisions for capturing security countermeasures cost data but doesn't provide the program manager any tools with which to do security cost benefit analysis.[17] A study should be undertaken by the Acquisition Systems Protection Office to identify and develop appropriate security cost benefit techniques and procedures. The resulting tools and products should be incorporated in a change to the final DODO 5200.1-M.

Recommended Topics for Further Research

Outlined below are a few potential topics for further research related to issues and subjects addressed in this thesis.

1. Technology Protection in World War II. The Manhattan Project was but one of many highly classified acquisition programs conducted by the U.S. during World War II. Several of these programs were large enough in scope to compete directly with the atomic bomb effort for resources. An analysis of the counterintelligence and security efforts undertaken in support of these programs might yield

contrasting lessons learned, while addressing some lesser known aspects of World War II history.

2. A reexamination of the Oppenhiemer Case. The investigation of J. Robert Oppenhiemer's communist affiliations and wartime contacts with Soviet agents is probably the best documented Manhattan Project related security investigation in the open sources. Most of the facts relating to the case were made public during the Atomic Energy Commission's investigation and proceedings which ultimately lead to the revocation of Oppenhiemer's security clearance. In a soon to be published book, Special Tasks: The Memoirs of an Unwanted Witness - a Soviet Spymaster, former NKVD and KGB officer Pavel Sudoplatov alleges that both Oppenhiemer and his associate Enrico Fermi, assisted the Soviets in their quest for atomic secrets. An analysis of Sudoplatov's allegations using primary source information concerning the project's countermeasures programs and the Oppenhiemer case file might shed some light on the validity of those allegations.

3. Biographical Studies. As mentioned in Chapter 2 the vast majority of the key scientific personalities involved in the Manhattan Project either wrote autobiographies or had biographies written about them. None of the key security players have been examined similarly. An obvious candidate for such a work would be Colonel John Lansdale, General Groves' security advisor. Lansdale was

heavily involved in security support to the atomic bomb effort from its inception. During the course of the war he personally handled not only the most sensitive intelligence and counterintelligence operations but also congressional liaison and in some cases foreign diplomatic missions. After the war he was a frequent witness during the congressional hearings on atomic espionage and the Atomic Energy Commission's proceedings against Oppenhiemer. A biography of Colonel Lansdale would be especially timely in light of the renewed interest in the Manhattan Project and atomic espionage brought on by the impending publication of Sudoplatov's book.

Conclusion

General Groves and his staff faced an enormous challenge in building the atomic bomb -- perhaps the greatest engineering challenge undertaken up to that time. Attempting to complete the Manhattan Project in absolute secrecy made that challenge all the more difficult. In retrospect, given the size and scope of the project, it is not surprising that the project's security effort was imperfect. That the project was able to maintain as much secrecy as it did, for as long as it did, is a testament to the hard work and ingenuity of the project's hundreds of security professionals.

The ultimate lesson learned from the counter-intelligence and security experience of the Manhattan

Project is that security matters. Indeed, sometimes security, or the lack of it, can change the face of history. President Truman's announcement of the explosion of the Soviet atomic bomb on September 23, 1949 took much of the world, including the U.S. government, by surprise. Estimates of how soon the Russians would have the bomb had ranged from ten to twenty years. General Groves had estimated that the Soviets would not have the bomb before 1960.[13] While the debate about how much time the Soviets saved through their atomic espionage continues, it is now generally accepted that they saved a minimum of several years. How different the world might have been had the Soviets failed to build a bomb until 1960 or perhaps failed to build one at all. When historians complete the history of the Cold War period perhaps they will decide that the opening round occurred when the Russians sent their spies to seek America's atomic secrets.

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[15]Ibid., p. 4.8.

[16]Ibid., p. 2.7.

[17]DOD 5200.1-M, Acquisition Systems Protection Program (Draft)(April 1993), pp. 3-11/12.

[18]William Lawren, The General and The Bomb, (New York: Dodd, Meade & Company, 1988), p. 267.

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